SCIENTIFIC AMERICAN

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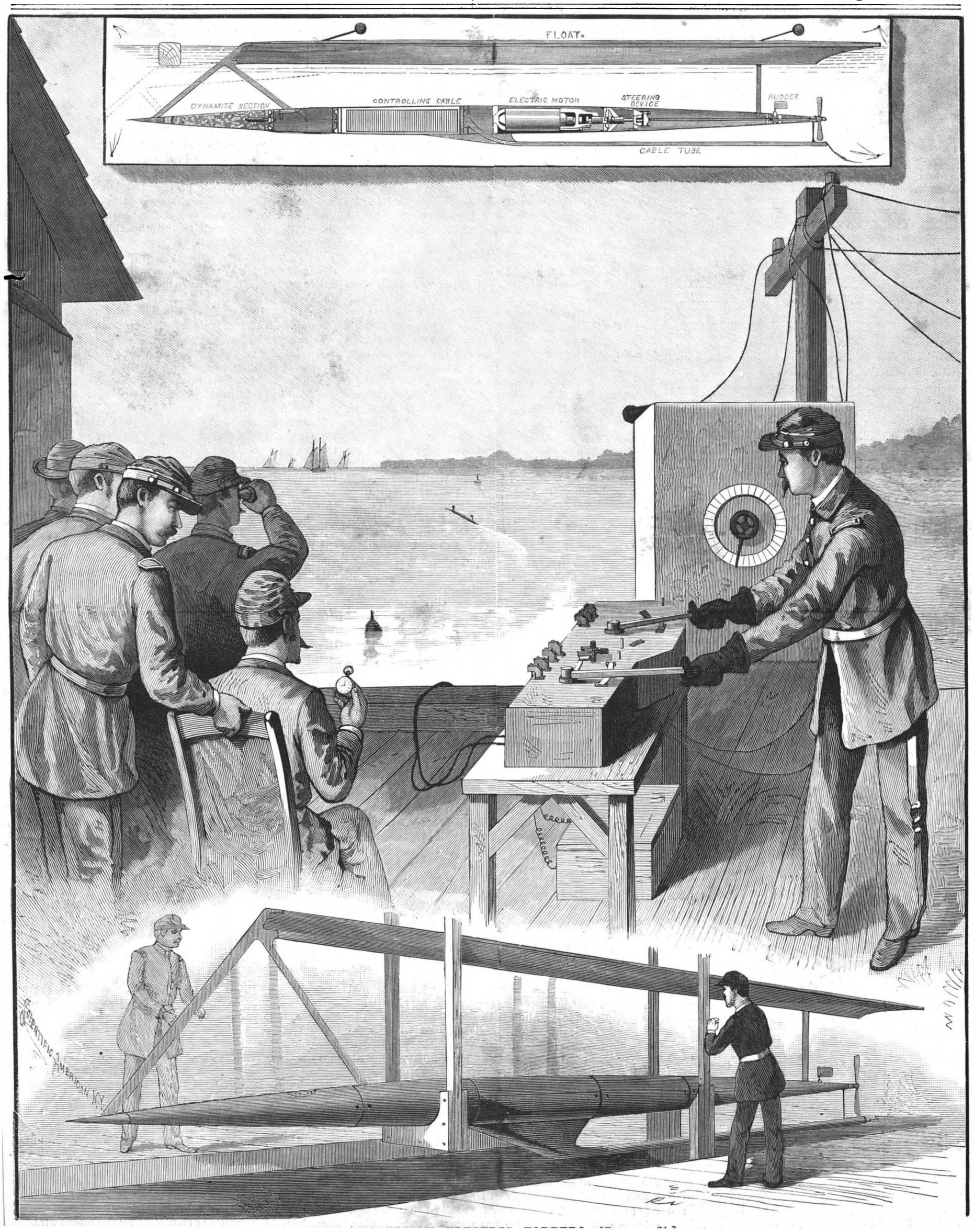

THE SIMS-EDISON ELECTRIC TORPEDO.—[See page 21.]

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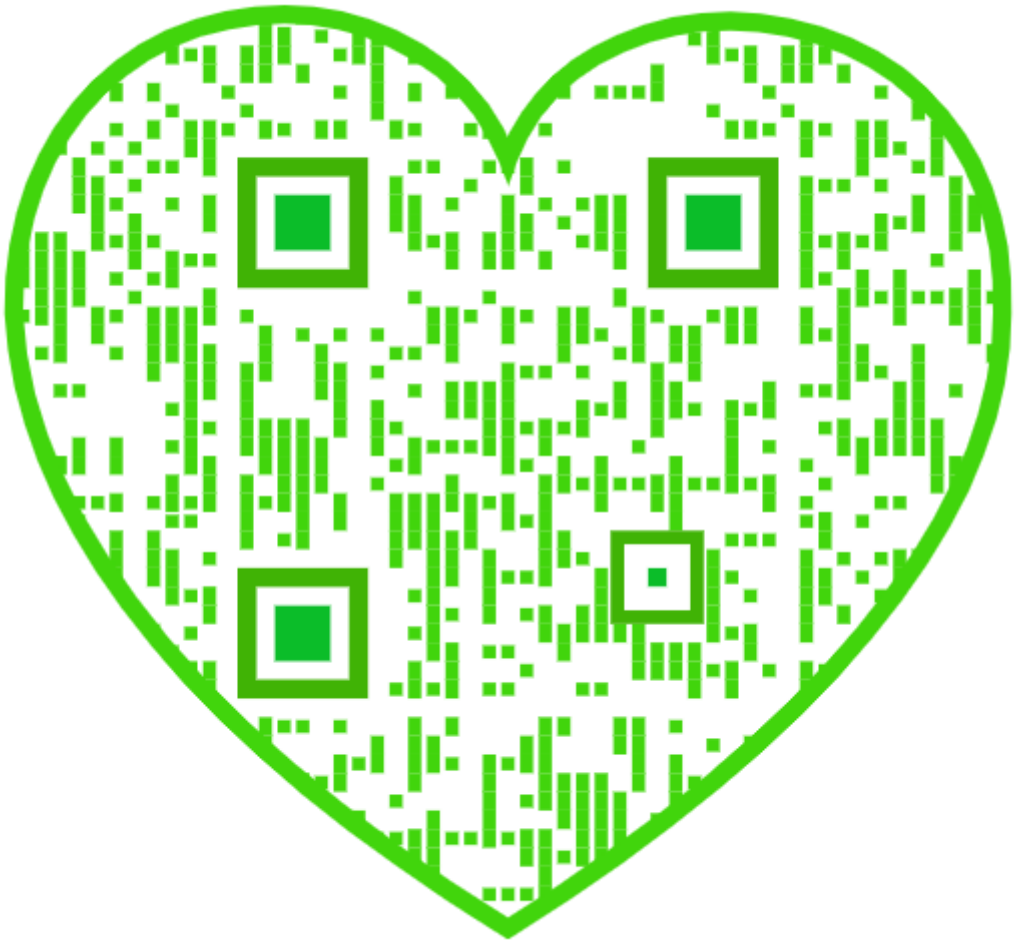

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CONDITION AND NEEDS OF THE NAVY.

In the construction of a new navy, the most important factors are effective ships and well trained, loyal crews. Quite recently it was shown in these columns that, as yet, we have not got one first-rate modern war ship. For, surely, ships having neither the armor nor the battery to stand and fight nor heels to run away cannot, in any fair computation, be accounted effective. But, even if we had a fleet of ships fully up to the modern mark in point of speed and power of aggression, such crews as now are in the fleet, being fully seventy per cent foreigners, would not suffice to man them properly. Officers we have a-plenty, well trained, earnest men and skillful navigators; there are no better with any colors. But not all their skill would avail to train the riff-raff of European sea port towns into old style Yankee blue-jackets with a genuine love for the flag and an abiding faith in everything under it.

For, according to official reports, notably that of Lieutenant Staunton, U. S. N., most of these alien crews ship for the pay and the living, $21.50 a month for able seamen and all the rations they can stow away. The small affair on the Isthmus of Panama some time ago showed what, indeed, had long been surmised, that they have poor stomachs for fighting though eager enough in the mess-room, and so, when there was work to be done or a prospect of it, the officers picked out the Yankee boys coming from the training ships and what stray native seamen were at hand, to face it.

There is a general feeling in the fleet that our best recourse is to training ships, more of them; the material those afloat are turning out being adjudged good and fit. There seems little hope of attracting American sailors, at least in time of peace and with no merchant fleet to draw from. Nor is the reason for this far to seek or hard to understand. Young America in the sea coast towns that used, in the old days, to look forward to a life at sea, has more to tempt him ashore. The humdrum life, the strict discipline, with neither adventure nor chance of promotion to make it bearable, is not to his liking. His energy and intelligence, like the shipping merchant's dollars, bring a greater profit ashore, and so he will not go a-sea.

There was a promise, and not so long ago, that we could turn our sea coast men into warsmen when the time was come for action, for then they have always been ready enough to lend a hand; easily taught, too, to man the yards and work the guns. But now there are not any yards to man or, rather, such work is now become insignificant, and the modern gun crew needs long and careful training. So does torpedo handling, machine gun working, search light training, and the preparation to receive torpedoes. Work with the pike and cutlass, broadside guns and carronades, spar and sail exercises, has given place to drilling of quite a different kind, and the sailorman who should come aboard to ship, with the claim that he could hand, reef, and steer, would be looked upon as a veritable Rip Van Winkle, perhaps be laughed at by the machinists and stokers. Indeed, there is a movement afoot in England, and one, be it said, that is gaining ground here, to do away with spars and sails on the war ships altogether, on the not unreasonable ground that they are only an incumbrance, useless top hamper, serving to make the ships unsteady and, when shot away, imperiling the crew or disturbing the precision of the gun crews.

As to the fighting force, some of the best authorities aver that the men picked up from the merchant and fishing fleets are handier, more earnest, and consequently steadier than regular warsmen's crews, more especially that portion of these that have been since boyhood in the government service. They have not the self-reliance of those accustomed to shift for themselves, nor, curiously enough, the strength. That's what trained observers allege; the latter allegation being accounted for by the fact that they have, for so long, slept in close and crowded quarters on the training ships.

Again, in our service especially, the material that can be induced to enter as apprentices on the training ships is not by any means as promising as that coming from a merchant fleet or 'longshore. "I am ordered to tell you that you cannot become an officer," is what the shipping master aboard the training ship says to the young aspirant before he is allowed to sign the ship's papers. What that remark and the prospect it portends will not drive away, in our country, is not always worth the shipping. Experienced army officers have long insisted that it were better for the service if men in the ranks, showing efficiency and worthiness, were permitted to wear the shoulder straps without any intermediary political influence, and the recommendation seems not unreasonable in the land service.

Aboard a modern war ship it is, however, quite different. Years of mathematical and methodical study are required in the education of the naval officer of today; a long special course in theoretical and applied science, and the apprentice has not the opportunity, even if he has the capability, to receive it.

The American Engineers in England.

The visit of the party of American engineers, nearly 300 in number, to the Paris exhibition, has already been noted in these columns. In passing through London they were royally entertained. We give the following from the London *Times:*

As soon as it was known that large parties of American engineers proposed to pass through England on their way to Paris, the council of the Institution of Civil Engineers formed a reception committee exclusively from members of all classes of the Institution; and this committee elaborated a programme of arrangements covering the period from the arrival of the visitors at Liverpool on the 5th of June to their departure for Paris on the 20th. The visitors came over in two sections. Members of the American Society of Civil Engineers arranged a trip by the City of New York, and the joint engineering societies specially chartered the City of Richmond. The two brought about 270 civil, mechanical, mining, and electrical engineers. The programme of the reception committee commenced on the 6th, with visits to the Liverpool docks, Messrs. Laird's shipbuilding works at Birkenhead, and the Mersey tunnel, and a *conversazione* in the Liverpool town hall in the evening. On the 7th the party was divided into three sections, who visited respectively the works of the London and North-Western Railway at Crewe, those of the Midland Railway at Derby, and those of the Lancashire and Yorkshire Railway at Horwich; and the third section was also entertained at Manchester, dining in the city hall. The Whitsuntide recess was spent in tours in Wales, the Lake district, Warwickshire, and Derbyshire. The entire party was supposed to have assembled in London on Wednesday evening last.

On the 13th they met with a cordial reception in London. In the morning, after a choral service in Westminster Abbey, they received an address from the Dean in Henry VII.'s Chapel; they then visited the Houses of Parliament; and in the afternoon they met at the Institution of Civil Engineers. The reception was held in the library, the visitors being received by the president, Sir John Coode.

The more prominent members of the American party were publicly presented, these being Mr. D. J. Whittemore, past president of the American Society of Civil Engineers; Mr. H. R. Towne, president of the American Institute of Mechanical Engineers; Mr. A. E. Hunt, vice-president of American Mining Engineers; Mr. T. C. Clark, Dr. Emery, Mr. Kerchoff, and Professor R. H. Thurston.

Sir John Coode, as president of the Institution of Civil Engineers, on behalf of the entire body of engineers of Great Britain, said he esteemed it a high privilege and pleasure to tender the American visitors a hearty welcome to the old country (cheers) whence the visitors' forefathers sprang—the island home of Britons. (Cheers.) This welcome was no empty compliment. The first hour when the members of the Institution heard of the visit, the wish was spontaneously and unanimously expressed that the sojourn of the American visitors should be made socially and professionally as pleasant as possible. (Cheers.)

He then tendered them and read a formal address of welcome, which was engrossed and adorned with the portraits of Watt and Stephenson, with pictures of a steam engine and a locomotive engine.

Professor R. H. Thurston, the past president of the American Society of Mechanical Engineers, and member of the visiting societies, who was received with cheers on rising, said he had been desired by his colleagues in those societies to make a response to the eloquent and friendly, impressive and hearty address of welcome to which they had listened from the president of the Institution. After an expression of regret that he felt himself unable to do justice to the sentiments of appreciation and the generous impulses which had promoted so unprecedented a reception, he said that they came as cousins of the blood in the younger Britain, in the newer England across the rapidly narrowing Atlantic. (Cheers.) The new and old were coming daily nearer in heart and thought as through the labors of British engineers they were continually being brought nearer in space and in time by ties of the electric wire as well as by those giant shuttles flying to and fro across the sea, weaving as time went on a bond of closer and closer texture. (Cheers.) The Americans did not come as aliens, but were rather returning to their old home (cheers), looking upon the scenes around and upon the friends who greeted them and the people among whom they sojourned as might the long absent returning traveler to the land of his nativity. (Cheers.) Some present were but one generation removed from the fatherland. More were grandsons of migrating Britons, and a very large proportion of the members present traced their family lines across the ocean long subsequent to the time of Cromwell. These and the minority of the noble Teutonic stock had played their part in giving strength and stability to the government of 65,000,000 of people by that people. (Cheers.) They had seen the growth of 150,000 miles of railway, the spanning of 4,000 miles of continent by the magic wire, the building of the workshops of a great nation, above

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which formerly was an unmeasured expense of trackless forests sparsely peopled by rude tribes of savages.

The people of America had made safe the integrity of their government by the most tremendous war known to chronology, necessitating the creation in a few short months of navy and army and of all the materials of war for two great armies aggregating two millions of men. This people, whose task it had been to form wastes into abodes for civilized men, had now come home to see what the latter work of the older nation had been. (Cheers.) They had come out to see the Manchester ship canal, the bridge over the Forth, the workshops on the Clyde, where were built the greatest of steamships, and also the locomotive building at Crewe and Horwich, where were constructed those marvels of concentrated energy which annihilated space and time, to the confusion of all the older prophets of our race. (Cheers.) The Americans also came reverently to bow before the tombs of the older masters of their craft, so largely the authors of the present prosperity and greatness of the British empire as well as of the American republic (cheers)—to make, in short, a pilgrimage which had been until now the unrealized dream of many years. (Cheers.) The speaker then proceeded to comment upon the significance of that meeting, at which the hands were joined of the professions belonging to both great countries—the whole constructing professions of the English-speaking race, which regarded the meeting as the advance guard of that army of peace which was revolutionizing and civilizing and promoting in a thousand ways the best interests of all mankind.

They all felt interest in the land of Watt, Stephenson, Smeaton, Telford, Rennie, Brunel, Armstrong, Nasmyth, Napier, Whitworth, Bessemer, and the old home of Russell and Siemens. He spoke of the admiration which the Americans felt for the shipbuilders who could give to their engines the power of many thousands of horses and to the ships a speed that made the crossing of the Atlantic a seven days' pleasure trip, as well as for the railway builders who could transport their passengers with celerity and safety. They came to see these things, and to inspect the mighty British war vessels and apparatus which made the British nation the mistress of the seas in peace and war, and preserved that system of home and colonial polity which gave the empire of Great Britain continuity in time and extension in space. The hospitality they had received was simply commensurate with the resources of the realm governed by their noble Queen, and the Americans present trusted that this meeting would lead to an institute of engineers of all departments, to which delegates would be sent at stated intervals to formulate grander schemes still of further conquests of the forces of nature. (Cheers.) The members of the profession would thus show themselves to be fit successors of the great discoverers who had been their predecessors or were their contemporaries. (Cheers.)

The Practical Physician.

At the Congress of American Physicians and Surgeons, held in Washington last September, Dr. William H. Draper, in his presidential address before the Association of American Physicians, presented in a very graphic and striking manner what should be regarded as the qualifications of the practical physician to-day. He must be a man of broad views, who has all kinds of knowledge; who controls the whole medical situation. He is not a bacteriologist; he is not a pathologist; he is not a chemist or a physicist; he is not merely a therapeutist; he is not a specialist of any sort, nor does he look at clincical medicine from any limited horizon; but he is a man who in some sense is master of all these several branches of medical education by reason of combining as much as is possible of the sciences which these different divisions represent, and thus perfects the most beneficent of all the arts. "It is he who, in his high position as the servant of humanity, must attain that wisdom which results from combining knowledge with the instinct and the skill for its useful application."

Silvering Iron.

A new Austrian patented process for silvering articles of iron is thus described: The article is first plunged in a pickle of hot dilute hydrochloric acid, whence it is removed to a solution of mercury nitrate and connected with the zinc pole of a Bunsen element, gas carbon or platinum serving as the other pole. It is rapidly covered with a layer of quicksilver, when it is removed, washed, and transferred to a silver bath and silvered. By heating to 300° C. (572° F.) the mercury is driven off and the silver firmly fixed on the iron. To save silver the wire can be first covered with a layer of tin; 1 part of cream of tartar is dissolved in 8 parts of boiling water and one or more tin anodes are joined with the carbon pole of a Bunsen element. The zinc pole communicates with a well cleaned piece of copper, and the battery is made to act till enough tin has deposited on the copper, when this is taken out and the ironware put in its place. The wire thus covered with tin chemically pure and silvered is much cheaper than any other silvered metals.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

The Paris Exhibition.

EXTRAORDINARY RECEPTION OF THE VISITING MEMBERS OF THE JOINT AMERICAN ENGINEERING SOCIETIES.

LONDON, June 18, 1889.

The event of most importance just now at the exhibition is, so far as Americans are concerned, the arrival and entertainment of the joint American engineering societies, which, so far, has been an enjoyable and brilliant affair. The most prominent event prior to reaching London was the visit to Crewe by special train, luncheon being served in the drawing office previous to the inspection of about one-half of the L. and N. W. Railway shops. The English papers and technical journals will have given you the news concerning the generalities of this and other visits to workshops, palaces, etc., and of the receptions at Lord Brassey's, the Baroness Burdett-Coutts, etc., and all I propose to do, therefore, is to refer to a few items of interest to engineers, cautioning your readers not to assume that the flowery speeches of the visitors to their entertainers mean a complete surrender of all claims to professional equality, or that the heartiness with which English institutions, etc., have been cheered by the visitors means an abandonment of their faith in their own.

When, for example, we were asked not to look upon ourselves as foreigners or as people away from home, but rather that we had returned home, and when we heartily cheered that expression, it did not mean that we had not got a home of our own, or were ready to abandon it, and return like prodigal sons. So, likewise, the expression of an opinion privately of an English gentleman to the effect that England could undoubtedly depend upon America's help if in international difficulties, etc., was only an emotional hope born of the exuberance of the moment. One does not altogether understand why it is that the undoubtedly existing undercurrent of international politics should enter into the speeches made to and by the visitors, nor why this should always be the case when bodies of Americans and English or important English and American personages meet publicly. But there, we have been treated very handsomely, indeed so much so as to disarm criticism. I feel it incumbent, however, to say that we have not, or a goodly portion of us have not, surrendered all our independence, and when going through Crewe I heard many expressions such as, "Well, we have not got much to learn here in woodworking machinery," "Why, they only plane one side of a piece at a time, while we plane all four sides at once."

I noticed also a vertical cylinder boring machine on which it took a man a day to bore a 22 inch locomotive cylinder without facing it, whereas the Wm. Sellers machine will bore *and face* the same job in about four hours. One machine I found at Crewe is a good one, and I have not seen its equivalent or its equal in the large locomotive works in the United States. It is an emery grinding machine for small holes, say from five-eighths inch up to several inches in diameter, thus dispensing with a large amount of reamer work and the softening and rehardening of hardened work. The French have a similar machine at the exhibition, and I intend to closely examine the merits of both these machines in the interest of your readers.

A machine that seemed to interest our engineers very much was a horizontal double steam hammer, in which the hammers were mounted on trucks resting on rails, these trucks simultaneously retiring from and advancing toward the anvil, which was midway between them. By this construction the weight of the trucks, as well as that of the hammer, is utilized, and the violent shock incident to a solid foundation is avoided. The force that would be expended on the foundation is brought to bear upon the work, while the force of the blow is experienced equally on each side of the forging.

Since arriving in London the joint engineers have received quite an ovation, and invitations are pouring in from all sides, the last ones being from German engineers.

The Midland Railway, of England, offered a special train from Liverpool to London, with a luncheon and visit to their shops at Derby, but as the L. and N. W. R.R. had representatives aboard the steamship, while the Midland's courtesies were not made known until the party reached Liverpool, not a single individual honored the latter's invitation, and it has now renewed it for the return trip; but as the party breaks up in Paris, it has not been found practicable to get together a sufficiently numerous party to warrant an acceptance.

An unexpected incident of the joint engineers' visit is that it has been compelled to organize itself into a body independent as it were of the engineering societies of which it is composed. This became necessary in order to duly acknowledge the extraordinary courtesies extended to the joint party, which must, of course, suitably be done before separating in Paris. The acknowledgments take the form of engrossed and illuminated resolutions of appreciation and thanks to the Queen for her kindness in appointing special days for visiting Windsor Castle and St. James' and Buckingham Palaces; to the English Society of Civil Engineers for their magnificent reception at the Guildhall, the use of which for such a purpose is almost unprecedented; and engrossed resolutions of thanks to the various corporations and railways who have vied with each other in extending courtesies.

To defray the cost of these illuminated and engrossed resolutions, the members of the joint party subscribed £1 each, by which means a total of $500 will be reached, which is considered sufficient for the purpose. The programme for the proceedings in France may be summarized as follows:

June 20, reception at Calais by eminent French engineers and departure for Paris, stopping on the way to inspect the elevators at Fontinette, these elevators being substitutes for locks on canals. June 21, unappropriated. June 22, address of welcome by Mons. G. W. Eiffel, and ascension of the Eiffel tower, where a lunch is to be served on the lower platform at 12:30. For one hour the visiting engineers are to have the tower entirely to themselves. At 2 P. M. they divide into groups and are conducted to various classified exhibits, as mining, metallurgy, machinery and spinning, etc. June 24, visits to various places in Paris, as the observatory, sewers, tapestry manufactories, etc. June 25, exhibition and various visits to places of interest in Paris. June 26, Hotel de Ville and many other places of interest. There is not much Paris exhibition in this programme, but I doubt if it will be possible to find parties in sufficient numbers to make the seventeen visits which the full programme includes, and some will doubtless be abandoned; indeed, it has already been found desirable to respectfully decline some proferred hospitalities.

The extraordinary number of invitations has thrown a large amount of administrative work upon the committees of the visitors, and the thorough and expeditious manner in which they have performed their tasks and imposed duties reflects the highest credit on their executive abilities, and gives great pleasure to the entire party, not unmixed with a sense of warm gratitude; and if the exigences of the future should call for another $500 they will get it, as on the last occasion, at once and without a moment's hesitation.

JOSHUA ROSE.

W. F. Swift.

It is with the deepest regret we record the death of Mr. W. F. Swift, secretary of the Brush Electric Company, of Cleveland, O. The following details, taken from the Cleveland *Leader* of June 12, will be of interest to a large number of our readers:

"The death of William F. Swift, secretary of the Brush Electric Company, and a member of the board of directors, occurred yesterday morning at his home, No. 104 Streator Avenue. Although a young man, he had had a successful career both as a newspaper man and in the business world, and the announcement of his death will be received with deep regret by a large number of friends. His death followed a long period of ill health from which, until recently, no danger was apprehended. He was a tireless worker, and the persistent energy with which he performed his duties, regardless of his health or other considerations, undermined his constitution and probably led to the development of consumption, which was the direct cause of death. Mr. Swift was born in Ravenna, on March 7, 1852.

Those who enjoyed the pleasure of Mr. Swift's acquaintance will long remember his stanch fidelity to the interests he represented and his quiet affability and dry humor in the hours of recreation and unbending from business. His long connection with electric lighting had given him an interesting experience, and as he had followed the development of the business with an intelligent and keen perception of its possibilities, he was always a most delightful and instructive companion. His newspaper training, moreover, had quickened his appreciation of the manner in which to grapple with difficult questions, and he was not a little esteemed for his skill in the conduct of important negotiations.

William Taylor.

William Taylor, senior member of the firm of William Taylor & Sons, proprietors of the Columbian Iron Works, and a well known citizen of Brooklyn, N. Y., died at his residence there, June 17, at the age of 78 years. For 33 years he had been connected with the Columbian Iron Works, as originator and head, and the products of which in original and special machinery have been distributed to every part of the globe. Mr. Taylor came to this country from Manchester, England, in 1843, settled in Brooklyn, and at once engaged in the iron business. He had associated with him as partners his sons, James A., William J., and Edwin S. Taylor, who up to the time of his decease comprised the firm. Mr. Taylor was a man of great activity and genial disposition, which made him hosts of friends. He ranked high as an engineer and manufacturer. He was one of the original trustees of the New York and Brooklyn Bridge, and took great interest in that magnificent triumph of engineering skill.

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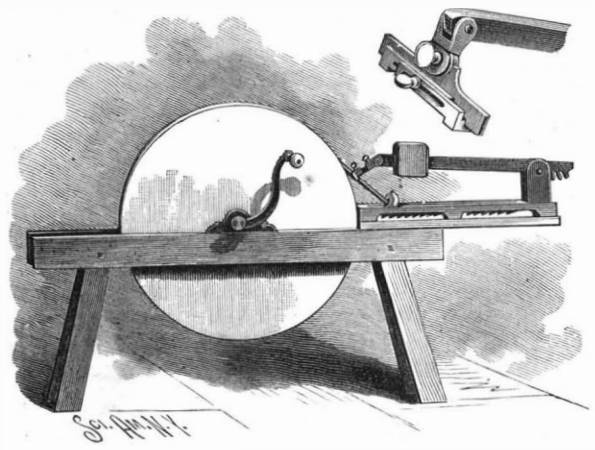
AN IMPROVED GRINDSTONE TOOL HOLDER.

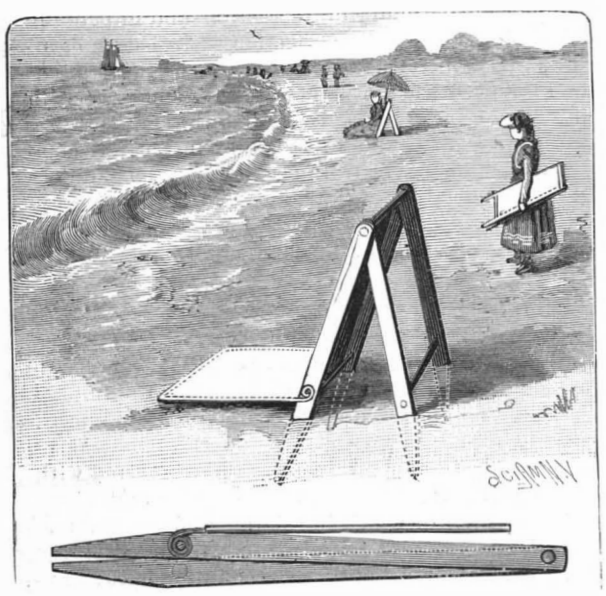
The illustration herewith represents a tool holder specially designed for automatically holding the tool in any desired position on the grindstone. It has been patented by Mr. Alexander H. Dick, of Cramer's Hill, N. J. It is formed with a bed plate adapted to rest on one end of the grindstone frame, and having a longitudinal slot through which passes the shank of a tool handle support, the lower end of the shank having projections adapted to engage teeth on the under side of the bed plate. The body part of the tool holder rests on top of the bed plate, and has in front a spherical depression into which is set the rear end of the tool handle. This handle support can be moved forward or backward on the bed plate and locked in any desired position. On the rear end of the bed plate is a lug in which is pivoted, at various distances from its end, an arm carrying a sliding weight which may be locked at any point on the arm by a set screw. To the free end of this arm is hinged a plate, as shown in the small view, in which is held a set screw on which is pivoted a horizontally swinging arm carrying clamping arms with lugs between which the blade of the tool is passed, and firmly held in the desired position. When the tool is adjusted in place, the operator places the sliding weight in position on the arm, according to the desired pressure with which the tool blade is to be held in contact with the grindstone. The body part of the tool holder support also has a transverse slot adapted to receive plane bits or tools of that kind.



DICK'S GRINDSTONE TOOL HOLDER.

A CHAIR FOR USE ON THE SEA BEACH.

The illustration herewith represents a chair designed to afford the occupant a comfortable back rest and a water-proof seat, the seat to be supported when in use by the sand of the beach, and be level therewith, so that the occupant may recline comfortably without danger from the dampness. This invention has been patented by Mr. Charles E. Koechling, of No. 323 Bowery, New York City. The side pieces of the back rest and of the bracing frame are beveled off at their lower ends to form legs which may be driven down until the seat is brought level with the sand. Over the frame formed by the side pieces is stretched canvas to form a back rest, and the seat is composed of a frame, preferably of galvanized iron wire bent into the desired shape, and secured to the ends of the lower round of the back frame, a vulcanized rubber-coated fabric being secured to the seat frame to make a seat impervious to water and moisture. The small figure shows this chair in folded position, for conveniently taking it to and removing it from the beach.



KOECHLING'S BEACH CHAIR.

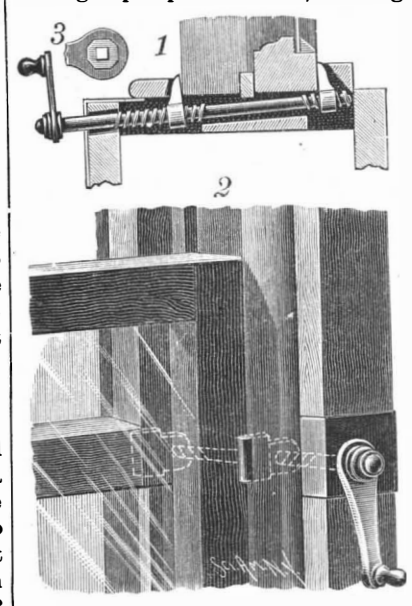
NOTE.—We stated in a recent issue that the Burr index, which is used in this office for keeping a record of the correspondence, was arranged for 10,000 names. It is, however, indexed for 160,000 names.

Telephone Tickets.

Beginning with the first day of June, the Southern New England Telephone Company will issue tickets for the use of those who are not subscribers to the exchange of the company. The company has found that there are a good many people to whom the occasional use of the telephone is a great convenience, for which they are willing to pay a small fee. Now the only way that they can avail themselves of the convenience of the service is to ask the use of their neighbor's instrument, thus bothering the neighbor and taking from the company that for which they do not pay. The tickets allow the holder one local communication from any subscriber's station, where the subscriber is willing to let the instrument be used. The tickets will cost ten cents each, in strips of five, and when the holder of the ticket uses an instrument, he will leave a ticket with the subscriber whose instrument he uses. This ticket the company will redeem as five cents cash in the settlement of its bills with that subscriber. Thus the company receives a small fee for the service that it renders, and the subscriber receives a small compensation for the accommodation that his instrument has been to the user of the ticket. The company is also testing several devices on the "put in your nickel and take out a bun" plan for the automatic combination of payment and access to the telephone.

AN IMPROVED SASH HOLDER.

The device herewith represented is designed to lock the sashes in any given position and prevent them from being raised or lowered from the outside. It has been patented by Mr. Ralph P. Waddell, of Alameda, Cal. Fig. 1 shows the application of the device in a horizontal section through one side of a window and frame, Fig. 2 being a perspective view, and Fig. 3 a section of the operating handle for turning the spindle.



WADDELL'S SASH HOLDER.

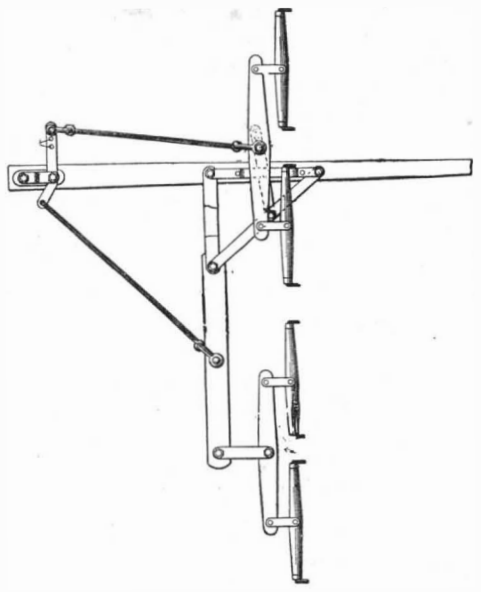
The sash-locking clamps are let into a recess in the jamb of the window, and project into recesses in the stop beads, their faces being flush with the inner faces of the stop beads. The clamps each have a threaded aperture, and are mounted on a reversely threaded spindle, whereby they simultaneously move toward each other, clamping the sashes against the parting strip when the spindle is turned to the right, and releasing them when it is turned to the left. The handle is formed with a six-sided or eight-sided hole, by which it is fitted on a correspondingly shaped collar, fitted on the square end of the spindle, by which the position of the handle can be changed when required, that it may be in a pendent position from the spindle when the clamps are tightened.

The Old Egyptian Encaustic Process.

In the older Egyptian mummies the face of the outer casing is usually modeled in relief, in a purely conventional way, but in this latest form of burial under the Roman empire a portrait of the deceased was painted on a very thin piece of wood and then fixed over the dead face. It is very remarkable to find such fine coloring and skillful drawing in work of this late date, which must have been turned out of an ordinary undertaker's workshop. The portraits, both male and female, are most vivid and life-like. The ladies are mostly dressed in a purple garment and the men in white, with a red orphrey. The modeling of the flesh is very skillful, and in some cases the coloring reminds one of the Venetian school from its rich depth of tone. A special point of interest about these paintings is their technical execution in the hot wax or encaustic process, as it was called. The pigments were mixed with melted wax, and then fixed in their place by holding a charcoal brazier near the surface of the painting, as is described by Vitruvius. The somewhat lumpy *impasto* of the surface is due to the hardening of the melted wax when the brush touched the cold surface of the panel, and, owing to the non-absorbent nature of the wood, the subsequent application of heat was not able to drive the wax below the surface, as was the case with encaustic painting upon stucco. One of these portraits is noticeable from its ornamental framing with a flowing pattern, formed by pressing wooden stamps upon soft stucco, which was afterward gilt, a process exactly like that which was so often used to decorate mediæval pictures on panel, especially retables, or *ancone*, as the Venetians called them.—*The Saturday Review.*

AN IMPROVED DRAUGHT EQUALIZER.

A draught equalizer to which four horses may be hitched, and which is designed to operate in an effective manner, is illustrated herewith, and has been patented by Mr. Charles F. Holck, of Laporte City, Iowa. This equalizer consists of a doubletree having singletrees, a bar pivoted at one end to a lateral frame on the pole and pivotally connected at its outer end to the doubletree, a cross bar pivoted to the rear end of the pole being loosely connected at one end by a rod loosely connected at its other end to the bar pivoted to the lateral frame on the pole. The singletrees on the opposite side of the pole are pivoted to the end of a bar extending across the pole and pivoted at its other end to the lateral frame. By this construction the draught of the horses secured to all the singletrees will be equalized, the doubletree on the pole being permitted to have a movement backward and forward on the end of a bar which is free to swing beneath the raised portion of a strap secured to the pole.



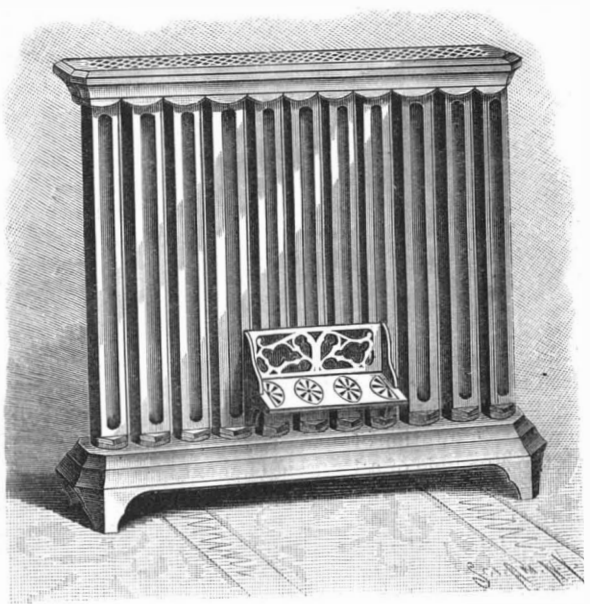
HOLCK'S DRAUGHT EQUALIZER.

A Large Head of Water.

France claims the honor of utilizing a higher water pressure than that recently put in operation in the Chollar shaft on the Comstock lode, in Nevada. At Brignoud, 2 kilometers from the valley of Gresivaudad, near Grenoble, a turbine 9 feet 10 inches in diameter was put in operation in the year 1875, utilizing a head of 1,638 feet. It is still working, and gives a force of 1,500 horse power with a flow of 300 liters of water per second.

IMPROVED FOOT REST FOR RADIATORS.

The illustration herewith represents a foot rest adapted to be readily connected to the ordinary form of radiator, the arrangement being such that not only will the feet of the user be supported, but the radiator pipes will be protected from all injury incident to the scraping of the feet against them. This invention has been patented by Mr. George C. Felter, Haverstraw, N. Y. This device is formed with a table or shelf having an apertured and slotted flange, through which pass clamping hooks to engage the radiator pipes, a guard or shield being arranged for movable connection with the table. The table is preferably made with grooved side flanges to receive downwardly extending projections formed upon or connected to the side flanges of the guard or screen, whereby the latter may be adjusted on or removed from the table. Provision is also made for the ready adjustment of the clamping hooks in applying the foot rest to a radiator having horizontal pipes.



FELTER'S RADIATOR FOOT REST.

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THE NEW ADDITIONS TO THE NAVY.

The 2,000 ton steel cruisers, now known as cruisers Nos. 9, 10, and 11, were authorized by an act of Congress approved September 7, 1888, the limit of cost being $700,000 each.

The principal dimensions are as follows: Length on load water line 257 feet, breadth extreme 37 feet, depth of hold to under side of spar deck plank amidship 19 feet 6 inches, draught of water mean normal 14 feet 6 inches, displacement in tons to load water line 2,000, tons per inch at load water line 15¼, area of immersed midship section 665 square feet, transverse metacenter above center of gravity 7 feet, moment to alter trim 1 inch 200 foot tons, indicated horse power (forced draught) 5,400.

Maximum speed per hour, 18 knots in smooth water. Complement, officers and crew, 185.

They are twin-screw protected cruisers with poop and forecastle decks, with open gun deck between; fitted with a water tight deck of 17½ lb. plating at side, reduced to 12 lb. in center, extending the entire length of the vessel, this deck being below the load water line at the side 36 inches. Below this deck is placed the machinery, magazines, and steering arrangements.

Among the improvements in these vessels is an increase of speed, rearrangement of battery, which is to be composed entirely of rapid fire guns, a cofferdam protection extending throughout the entire machinery space.

The berthing accommodation and officers' quarters have been greatly improved. Quite an innovation on previous arrangements has been made in the location of steerage, which is aft of the wardroom, giving the senior officers quarters nearer amidships, which is freer from the jar of machinery and motion of the ship; the entrance to the steerage is effected through the after six inch gun supports, which leave an exclusive entrance to the wardroom for the officers quartered there, and at the same time giving spacious and more retired accommodations to the steerage.

The main battery is composed of two 6 inch rapid fire B. L. R. and eight 4 inch rapid fire B. L. R. The secondary battery consists of two 6 pounder, two 3 pounder, two revolving cannons and one Gatling gun.

The torpedo outfit of these vessels will be six torpedo guns or launching torpedoes, fixed one in the stem and stern, and training tubes on the sides.

Automobile torpedoes will be fired from these tubes, and there will be a complete outfit of boat spar torpedo gear and charges. A conning tower, oval in shape, is located on the forecastle deck, being 7½ feet athwartships by 4 feet fore and aft, and 5 feet 4½ inches above the deck.

The tower is fitted complete with steam steering wheel, engine room telegraphs and speaking tubes. A wood pilot or chart house is fitted forward of the conning tower having plate glass windows, steam steering wheel, engine room telegraphs, tell-tale for rudder, chart table, etc.

The rig is that of a two-masted schooner having a small spread of a canvas.

Coal Endurance.—The normal coal supply is 200 tons, but the bunker capacity is 435 tons. This coal is disposed in wake of the machinery and boilers, so as to give the greatest protection.

Lighting, Ventilating, and Drainage.—There will be an installation of electric light on board. Means are provided for securing natural and artificial ventilation in the living and storage spaces, utilizing frame spaces, together with louvers and cowls fitted along the top, sides, and such ducts as are necessary to effect communication with the spaces below. Automatic valves are fitted in ventilating pipes where they pass through watertight bulkheads to prevent the flow of water from one compartment to another. Escape for the explosive gases generated in the bunkers is provided for by means of inlet and outlet pipes, and trunks leading to the funnel casings.

There is a complete steam pumping arrangement fitted to be used for bilge drainage or fire purposes; also 7½ and 5½ inch hand pumps for draining the watertight compartments, engine and shaft bearers, platforms, etc., delivering overboard or into the fire main.

The fire main is worked nearly the whole length of the ship, and can be charged with water at a high pressure from the steam pumps, being also connected with hand pumps, and fitted with the necessary nozzles and hose.

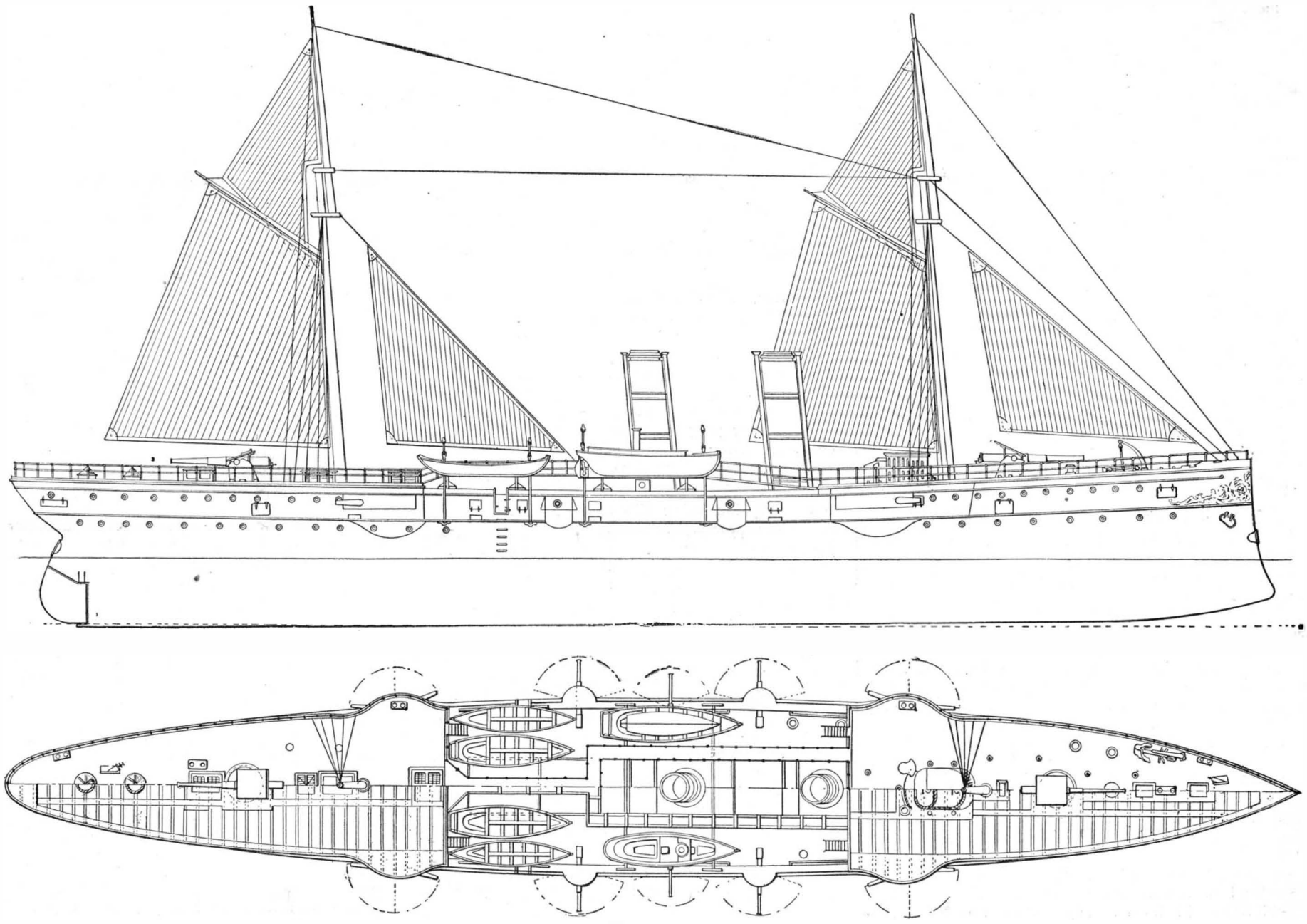
The motive power for the twin screws is furnished by two triple expansion engines of 5,400 horse power, with cylinders of 26½, 39, and 63 inches diameter, and a stroke of 33 inches.

The engines and boilers are placed in separate watertight compartments.

There will be independent air and circulating pumps, and auxiliary condensers and pumps for auxiliary machinery.

The crank shafts are made interchangeable. All framing, bed plates, pistons, etc., are of cast steel, with working parts of best forged steel.

The boilers are of steel, designed for a working pressure of 160 pounds, and are five in number, of the return fire tubular type. Three of them are double ended and two single ended. The latter are to be used as auxiliaries, but when steaming full power can be connected with the main engines.



THE NEW TWO THOUSAND TON CRUISER.

Artesian Wells in Iowa.

The SCIENTIFIC AMERICAN publishes an account of "the great Coolidge well recently completed, discharging 120 gallons of water per minute." This may be a "great well" for Kansas, but nothing to brag about for Iowa. The well on J. J. Cooke's farm, near Tripoli, discharged just twice that volume of water, as nearly as could be computed, but now it will take perhaps an hour to discharge a barrel. It is not that the well has failed, but that it has been stopped up in putting in gas pipe in lieu of the galvanized iron tubing first inserted. The hole has filled in with sand, which the drill pounds in solid, and but a little water works through. Mr. Cooke will drill through it, or failing in that, will put down a new hole.

A singular fact is that these flowing wells are quite numerous east of the Wapsie River, but there is none that we know of west of the river. The Cooke well is only 123 feet deep, and like the other flowing wells, no rock strata were pierced by the drill. The water is beneath a solid, impervious layer of sand. Across the road is another flowing well, 135 feet deep, cased with 2 inch gas pipe, and under perfect control. The water will spurt a jet 10 to 14 feet high, and can be carried on the roof of the house with an ordinary hose. The velocity of discharge was increased when the J. J. Cooke well was plugged up, showing a common origin, although deeper. East of these two wells (perhaps 80 rods) Mr. Countryman sank a 2 inch tubular well. The water rose to within 8 feet of the surface, and then sulkily waited to be pumped.

Mr. C. flattered himself that this was a good well, better by about $500 than a flowing well which was all the while "slopping over" and making things muddy. But when J. J. Cooke's well was plugged up, Mr. Countryman's forthwith became a spouter, and the water now gushes out day and night with reckless prodigality. This must also have a common origin. If it is an underground stream, it must be either wide or crooked. If a lake, then the farms there are only a crust, and no rocky shell to keep them from dropping in. At any rate they are wonderful wells, and if it were only known twenty-five years ago what was the condition of things, it would have been worth a good deal of money all this while.—*Waverly (Iowa) Republican.*

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[FROM THE LONDON TIMES OF JUNE 14, 1889.]

Visit of the American Engineers.

The visit to this country of a large body of civil, mechanical, mining, and electrical engineers from America and their entertainment by the Institution of Civil Engineers constitute an international occasion of no ordinary interest. We live in an engineering age. There are many ways in which the civilization of the present time might be characterized, but perhaps its true *differentia* is to be found in the supremacy of the civil engineer. The President of the French Republic is a civil engineer. The President of the British Association for the Advancement of Science is a civil engineer. Democracy and science thus do undesigned homage to the same sovereignty. The most celebrated Frenchman of his day is the projector and creator of the Suez Canal. The two Englishmen who have done more than any others to make the nineteenth century what it is are Watt and Stephenson. The lives of the engineers are in truth the romance, as their works are the reality, of the present age; and among engineers it will hardly be disputed that those of England and America occupy the foremost place. It would be invidious to award the palm to one nation or to the other. Both are of the same race, and each exhibits equal genius in diverse manifestation. It was in England, no doubt, that the engineering impulse took its rise which has transformed the modern world. The English nation transformed itself in the last century from a pastoral and agricultural into a commercial and industrial community. If symbols and realities went together, the woolsack on which the Lord Chancellor sits in the House of Lords ought to be a coalsack, just as the mace in the House of Commons—a survival of the primitive club—ought perhaps to be a torpedo or a repeating rifle. But, symbolism apart, the reality is unmistakable. The occasion and the men came together. The Hargreaves and the Arkwrights, the Brindleys and the Telfords, the Watts and the Stephensons, were partly the cause and partly the effect of the great industrial transformation. Their influence and example soon spread to America, where, instead of a society to transform, there was a vast continent to be peopled and subdued to civilization. If England set the example, America has bettered it. The first victories of modern engineering were for the most part won in the United Kingdom; the application of their results to the multifarious wants and occasions of modern life has been largely due to the ingenuity and enterprise of the United States.

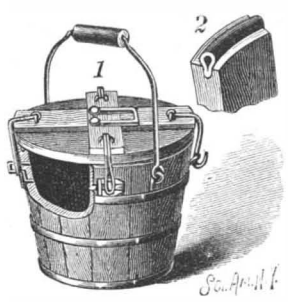
It is altogether fitting, therefore, that the civil engineers of England should offer a cordial welcome to their brethren from America. There is no jealousy and nothing but healthy and amicable rivalry between the engineers of the two countries. Each nation profits by the advances of the other in the peaceful and beneficent arts to which the engineer devotes himself. Each has its own province and its own specialty. To England belongs the dominion of the sea and all that pertains thereto, to America the subjugation of a continent and all that results therefrom. Hence England is unrivaled in everything that relates to the transport and manipulation of the materials of a worldwide commerce; America, on the other hand, has addressed herself with matchless ingenuity of inventive resources to the economy of raw labor, to the patient development of transcontinental intercourse, and to the rapid extemporization of all the appliances of material civilization. Notwithstanding these differences, however, the American engineers are the true children and heirs of their parents and predecessors in the old country. They have drawn their inspiration from England and applied it to the requirements and circumstances of America. There was a massive and monumental solidity about the work of the older English engineers which would have been impossible and inappropriate in the early engineering days of America. The land in which extempore railways and trestle bridges were among the primordial requirements of advancing civilization presented very different problems to the engineer from that in which Robert Stephenson built the Menai Bridge and the High Level Bridge at Newcastle, and Brunel, with magnificent audacity, designed and constructed the Great Western Railway. The skill was the same, but its application different in the two countries. Where American engineers were compelled to build for the day or the morrow, English engineers were able to build for the next generation and the century. But the extempore skill of the American engineers has in turn modified the massive conceptions of their English brethern, and our modern structures, such as the Forth Bridge, though not less monumental and permanent than the work of Stephenson and Brunel, are largely influenced by American ideas and experience. The cantilever principle is borrowed from the United States, and is itself, if we mistake not, the product of American conditions of work and American fertility of invention and audacity of construction. Thus the genius and skill of each country supplements that of the other. We borrow from America and America borrows from us, and both are better for the exchange. On the sea, however, our supremacy is unchallenged. The swift steamers which brought our engineering friends across the Atlantic were designed by English engineers and built by English shipwrights. Whether this supremacy is due to the native genius of Englishmen or to legislation which fetters the genius and chills the enterprise of Americans, we need not inquire. The supremacy is indisputable and undisputed. It may be that even in this direction America may some day better our example. If so, both countries will gain in the end by the friendly rivalry between them. The triumphs of the engineer are the common gain of the whole world. All may profit by them who have the wisdom to imitate and the skill to improve.

TARR'S IMPROVED WASH BOILER.

The accompanying illustration relates to an attachment for wash boilers to provide for the proper stowage of the boiler cover and of the wash stick. The invention has been patented by Mr. Asa F. Tarr, of Rockport, Mass. Fig. 3 represents a boiler provided with this attachment, Fig. 2 showing the under side of the cover, while in Fig. 1 the cover is represented as hung upon the body of the boiler. The invention consists in providing the inner face of the cover flange with hooks, the shanks of which extend upward through the top of the cover, to be there bent over to form stops which act as supports to the wash stick. To the boiler body there is connected a strip formed with loops adapted to receive the hooks of the cover, whereby the latter may be suspended at the side of the body when removed from the top.

AN IMPROVED OYSTER PAIL.

The accompanying illustration represents a patented invention of Messrs. John P. Kuhn and James A. Reynolds, of No. 212 West Third Street, Alton, Ill., the construction being also applicable to pails or tubs for temporarily containing or transporting liquid or semi-liquid articles or materials. The cover of this pail is preferably provided with crossed strips, and to the cover are secured, a short distance inward from its edge, a series of hasp-like fasteners, by a hinged connection. These fasteners are preferably formed of wire bent on itself, both members being bent at one end around staples on the cover, and downward at a right angle to engage or hook over staples on the pail. The cover is hinged to the pail by a device which may be of wire, as in the case of the fasteners. Flexible metal seals are provided for engaging the fasteners against accidental unfastening, and in the upper edge of the pail is an annular groove in which is fitted a rubber packing ring, as shown in Fig. 2, to form a tight joint between the pail and cover.



Ancient Tombs Discovered at Naples.

A subterranean chamber has been discovered under a house on the hillside at Naples. Along the center runs a mosaic pavement, and on each side there is a double row of sepulchers hewn in the rock, the fronts of which are stuccoed and painted and decorated with terra cotta and marble reliefs. Within the tombs were perfect skeletons, vases, and other objects, the antique lamps being in such good condition that when the new find was inspected by a party of German archæologists, the workmen made use of them to light up the vaults. The many well preserved inscriptions are chiefly in Greek, with some Latin, and prove that the epoch of these tombs was about 1000 B. C. Other tombs in a second chamber have not yet been excavated. Similar catacombs have heretofore been found in this locality.—*Pall Mall Gazette.*

SPEAKING of the pioneers in electrical application who have reaped golden harvests, *Progressive Age* says Professor A. G. Bell was at one time walking about Washington anxious to sell telephone stock for ten cents on the dollar. Before that he was teaching a deaf and dumb school in Boston. The telephone brought him fame and riches, and he has now an income of hundreds of dollars a day and a fortune of $6,000,000. C. F. Brush is said to have been working at $15 per week before he struck the electric light which made him a millionaire.

New Form of Gas Battery.

At a recent conversazione of the Royal Society, Mr. Ludwig Mond and Dr. Carl Langer exhibited a new form of gas battery, which we were told they anticipate may hereafter produce electricity at a much cheaper rate than by the dynamo; it is an improvement upon Groves' gas battery of fifty years ago. Each element, they state, of the battery consists of a porous diaphragm of a non-conducting material—for instance, plaster of Paris—which is impregnated with dilute sulphuric acid. Both sides of this diaphragm are covered with very fine platinum leaf, perforated with very numerous small holes, and over this with a thin film of platinum black. Both these coatings are in contact with frameworks of lead and antimony, insulated one from the other, which conduct the electricity to the poles of each element. A number of these elements are placed side by side, or one above the other, with non-conducting frames intervening so as to form chambers through which hydrogen gas is passed along one side of the element, and air along the other. One element, with a total effective surface of 774 square centimeters=120 square inches, which is covered by one gramme of platinum black and 0·35 gramme of platinum leaf, shows an electromotive force of very nearly one volt when open, and produces a current of two amperes and 0·7 volt or 1·4 watt, when the outer resistance is properly adjusted. This current is equal to nearly 50 per cent of the total energy obtainable from the hydrogen absorbed in the battery. The electromotive force decreases, however, slowly, in consequence of the transport of the sulphuric acid from one side of the diaphragm to the other. In order to counteract this disturbing influence, the gases are from time to time interchanged. The battery works equally well with gases containing 30 per cent to 40 per cent of hydrogen, such as can be obtained by the action of steam or steam and air on coal or coke, if these gases have been sufficiently purified from carbonic oxide and hydrocarbons. The water produced in the battery by the combination of hydrogen and oxygen is carried off by the unconsumed nitrogen and an excess of air carried through it for this purpose.

Haw Pond's Goings and Comings.

Haw Pond is about seventeen miles east of Cordele, and is perhaps one of the most wonderful natural curiosities in Georgia. It is situated in a low place, with hills on every side sloping down to it. Indeed, it is down hill for miles in going to the pond from any direction. Just at this time every year the water gradually goes down a few feet. Then there is a rush of water, a tremendous roar, and within a few minutes every drop of water disappears. This has happened for years, and it has never been known to prove a disappointment to those who go to witness the disappearance. On June 13, about a dozen Cordelians left here for the pond. They carried fishing tackle in abundance, and spent a day and night catching any number of the finest specimens of the finny tribe. They met about fifty others who had gathered at the pond to fish and wait for the water to disappear. Where the fishermen dropped their lines to the depth of ten feet Thursday night, there was scarcely a drop of water Saturday morning. In a day the water had disappeared completely. For miles around the ground is said to be unstable and liable at any moment to sink. Only a few weeks ago the bottom dropped out, and now only the tops of the trees can be seen above ground. Every year large crowds from the surrounding country gather to witness the disappearance, and this year there were perhaps one hundred and fifty people there. In the fall, when there is rain in abundance, and the streams are full of water, Haw Pond fills up and waits for the spring time, when it disappears again.—*Atlanta Constitution.*

The Lake Shore Drive.

"A plan is on foot," says a correspondent of a New York paper, "to make an addition to Chicago's Lake Shore Drive, which, if carried out, will give this city one of the finest and most extensive systems of boulevards and drives in the world. The present idea is to extend the beautiful drive which runs along the lake, through the handsomest portion of the North Side and through Lincoln Park. This drive now stops at the north end of the park. The new plan, which is well under way, is to extend it as far north as Lake Bluff, twenty-five miles north of Chicago. This section of country is by far the prettiest in this neighborhood. The flat shores of Lake Michigan gradually slope upward until at Lake Bluff they assume the shape of almost perpendicular banks, rising to a height of 100 feet, and showing the waters of the lake far below. A heavy growth of timber stretches to the west, while at other places it is broken by deep ravines that open up unexpected glimpses of the lake through the dark foliage. The new drive will run along as close to the lake as possible, and through the villages of Evanston, Highland Park, the new military post, Fort Sheridan, and Lake Forest."

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SIMS-EDISON TORPEDO.

It has been stated on good authority that the property exposed to destruction in the principal seaports of the Atlantic and Pacific coasts cannot be less in value than five thousand millions of dollars. To this must be added an incalculable amount of property dependent for its use and value on these seaports. It would be impossible to estimate the damage that might be done to New York City alone by a hostile naval attack, notwithstanding all the fortifications and offensive and defensive appliances within and around the city.

It is now pretty generally admitted that fortifications, of whatever nature, are of no great value in coast defense. Resort must be had to mines, torpedoes, and floating batteries, but it cannot be assumed that New York or any other port of the United States is adequately protected by any of these means. It is equally true that, should an emergency arise which would demand immediate and powerful coast defenses, the seaports would be practically at the mercy of the enemy. It would be impossible with the available facilities to construct additional batteries, gun boats, or even heavy guns within the space of several years. It is therefore evident that resort must be had to some other means for coast defense.

It is, perhaps, unnecessary to describe the different projects proposed from time to time for the protection of our harbors and cities, as all or nearly all of them have been illustrated and described in the pages of this journal. There is one device, however, which seems eminently worthy of the attention of the authorities, since it has novel features which distinguish it from all other devices for the same purpose. We refer to the Sims-Edison electric torpedo, the invention of Mr. W. Scott Sims and Mr. Thomas A. Edison.

This invention forms the subject of our front page illustration, in which the lower figure is a perspective view of the torpedo, the upper figure a longitudinal section, and the central figure is a sketch of one of the experiments with the torpedo.

The torpedo consists of a submerged portion attached to a float having the form of a boat. The submerged portion is a spindle-shaped copper shell containing the propelling machinery, a cable by which the current is conveyed to the electric motor and steering apparatus, and a charge of dynamite or other explosive.

The spindle-shaped shell is connected with the float at the bow by means of a triangular steel frame, and at the stern by a post and an angled bar. The float, which is of copper, is made air tight and filled with buoyant material, so that if it should be perforated it will still be able to sustain the submerged part. The triangular frame which connects the two parts at the bow extends up over the top of the float, and serves to either lift obstacles with which the torpedo comes in contact or to depress the torpedo, enabling it to run underneath the obstruction.

The spindle-shaped shell is divided into four compartments by transverse bulkheads. The forward compartment contains dynamite, the second is vacant, the third contains the electric cable which conveys the current to the propelling and steering apparatus, also to the mechanism for exploding the dynamite. The fourth compartment contains an electric motor of 40 horse power, also the electric steering apparatus. The armature shaft of the motor is connected through a system of gearing with the shaft of the propeller, which extends through the stern of the shell, and is provided with a two-bladed screw.

The float is provided with a pair of short folding masts having spherical heads, the masts, when elevated, serving as guides to the manipulator on shore in steering and discharging the torpedo. The cable is carried by the torpedo, and one of its ends is permanently connected with the various electrical parts of the torpedo, while the other end is connected with the switch upon the shore or upon a vessel or float from which the torpedo is launched and managed. By this arrangement, the dragging of the cable by the torpedo along the bottom is avoided.

The amount of dynamite carried by this torpedo is from 250 to 500 pounds, according to the size, and the length of the electric cable varies from 6,000 to 11,000 feet. The screw propeller is thirty inches in diameter, and the motor has sufficient power to drive the torpedo at a high speed. The electrical steering gear perfectly controls the movements of the torpedo, and the speed is regulated by a rheostat on shore. It is stated, not officially, however, that this torpedo has attained a speed of over twenty miles per hour during some of the tests.

When the torpedo arrives at its destination, it is exploded by the manipulator through the medium of the electric current.

The several points of superiority claimed for the Sims-Edison torpedo, as regards its thorough adaptability to offensive and defensive naval warfare, are as follows:

It is moved by a practically inexhaustible power generated outside of the torpedo itself and transmitted from a place of comparative safety from the shore or on shipboard. Its movements, whether ahead, to port or starboard, in the direction of the altered or changing course of an enemy, or on its return, are directed and controlled by the intelligent will of an operator in a place of safety, nothing being left to blind chance.

It cannot be stopped by obstructions, as it may be deflected to the right or the left, or it may be made to return at will, while by its own automatic action it clears the way of cables, chains, spars or rafts, or passes under the obstructing object.

It is portable, light, and of a convenient size, and being made in four small sections, is easily stored on land or on shipboard, and it can be taken apart and put together in a few minutes.

The explosive charge being submerged, it is out of the way of shot and shell.

For land fortification, it is proposed to have the Sims-Edison torpedo anchored by means of electric cables, at different parts of ports, or in bomb-proof canals with lock-gates, where also will be placed the steam engine, boiler, dynamo machine, and the operators for working them. The operators will receive orders by telephone or otherwise from sentinels, pilots, or watchmen stationed for that purpose. In such cases the operators and the machinery for generating and transmitting the power will at all times be in a place of safety, and the torpedo and its appurtenances under complete control.

For naval offensive purposes, it is proposed to have one or more of the Sims-Edison torpedoes travel with its own power, about 100 feet ahead of or off from the side of a steam war vessel, the torpedo being attached to the vessel by electric snap cables, the pilot of the vessel having control of the movements of the torpedo. By this arrangement the Sims-Edison torpedo may travel any required distance at sea, and when wanted for action, it may be released and sent off at once and under full speed, saving the time that would be consumed in launching from a vessel when preparing for action or when under fire. This maneuver is possible only with this torpedo, for the reason that its propelling power is not within itself, but with the operator, and being without limit as to quantity, is never exhausted. All other torpedoes contain their propelling power within themselves, which, being limited in amount, is soon expended. They must, therefore, be launched while the vessel is in front of an enemy at short range, and while preparing for action or actually under fire. Although the Sims-Edison torpedo can be used for any war vessel, it is desirable that naval vessels should be built whose principal armament should consist of these torpedoes, and which should have sufficient speed to overtake the heavy ironclads and then easily destroy them with the torpedo. Such a vessel would also form a valuable agency for clearing a channel or coast line of fixed mine torpedoes, by the process known as countermining.

Means of Producing Cold.

The approach of summer, with a possible accompaniment of heat, induces ideas respecting the production of cold. Of the many uses of refrigeration during a torrid, sultry, tropical state of the atmosphere it is needless here to speak; those who work with gelatine plates, and especially those who have to manufacture them when the thermometer is in the vicinity of the nineties, appreciate full well the desirableness of being able to convert dog day heat into hyperborean chill, and the great value of any means by which such conversion may be effected. The production of cold is merely the abstraction of heat from the body that is being operated upon. The means for effecting this have of late been undergoing advances toward perfection. It is only the other day since we saw in a well heated manufacturing engineering shop a considerable quantity of mercury frozen quite solid while it was exposed to the warm atmosphere of the workshop. This, it must be admitted, indicates a high advance in the art of congelation.

Concerning methods of producing cold, there are three of which we shall here speak. The first is the well known one of imparting cold to water by dissolving in it certain substances, of which there are none which in our estimation can vie with nitrate of ammonia for general efficiency and undoubted convenience. In addition to this, it is also the most economical of all saline bodies, as it is not wasted during use, but may be employed over and over again. If a thermometer is placed in a tumbler of water, at say 50° Fah., and some crushed crystals of the nitrate of ammonia are then thrown into the water, the column of mercury will be found to descend with singular rapidity until it reaches 26° to 27° below the freezing point, or about 5° Fahr. There are several mixtures which can be made by which a much greater degree of cold can be obtained, but these when once used cannot be used again. But with the ammonium nitrate it merely suffices to pour the solution out into an evaporating dish after being done with, and having driven the water off by heat, or otherwise, place the crystals into a bottle, when they are ready for future use in a similar way.

We here give an illustration of one way by which the knowledge of the above mentioned fact may be serviceable. We had once some gelatine plates to develop in a semi-tropical country at a time when the heat was intense and the water so warm as to endanger the film during development. We placed the developing solution in a japanned tin developing tray, and placed that tray inside of another slightly larger, and in the bottom of which we scattered a few crystals of nitrate of ammonia, afterward pouring in a little water. This reduced the previously high temperature of the developer to one that could not possibly affect the too soluble gelatine of which the film was composed.

A second system for the production of cold consists in the compression of air. Thus compressed, and forced into a reservoir, it becomes heated, as every one knows who is familiar with the working of an air gun. But when cooled down again, before it is suffered to escape, its expansion is attended by great cold. "If when compressed it is allowed to cool down to the ordinary temperature and then to escape, it will be cooled below that temperature just as much as it was heated by compression. Thus, if in being compressed it had been heated 100°, say from 60° to 160°, and then allowed to cool to 60°, on escaping it will be cooled 100° below 60°, or to 40° below zero, which is the temperature at which mercury freezes." This is the principle of the cold air chambers now so extensively employed on shipboard for the transport of frozen provisions from Australia and New Zealand.

The ingenious photographer who dreads the preparation of gelatine plates in hot weather will in this discover the means by which he may be enabled to keep his coating room at fifty degrees or sixty degrees during the most sultry months of the summer, aided by a small gas or petroleum engine. We have devised a most perfect means of effecting this, by manual power if desired, and that only applied at occasional intervals, but a detailed description of it would be out of place in this article.

It is well known, by some at any rate, that the condensation of certain vapors is attended by extreme cold. On the principles actuating this phenomenon we do not here enter, but confine ourselves to giving a brief description of one of the machines--if machine it may be called—by which the principle has obtained its latest outcome. This apparatus, which has received the trade name of "The Arktos," consists, roughly speaking, of a tube bent ∩-shape, at the end of one limb being a reservoir which contains strong liquor ammonia. This ammonia should be as strong as possible; although that so well known among photographers as 880 will do, yet Mr. Loftus Perkins, the inventor of the apparatus, informs us that he prefers it much stronger, say 875, a strength he certainly manages to obtain. This bent tube has its air abstracted and is hermetically sealed, and heat is applied to the ammonia reservoir, by which the ammonia liquid parts with its gas. When the source of heat is removed and the gas re-enters the water, the cold is produced at the farther limb of the apparatus in a degree of such intensity as to cause a deposition of the moisture in the atmosphere in the form of dry snow. So great is the cold produced that, as previously hinted, we have seen, and that too, in a warm room, the solidification of mercury in the vessel into which the end of the tube was dipped. One end of this tube may be called the boiler, and the other the refrigerator, and a condition of success is that the connecting pipe between the two shall be kept cooled while the boiler is being heated, so that all gas passing to the refrigerator may enter it in a comparatively cool state. When this is used on a large scale, it suffices that a fire be applied for two or three hours once a day, by which the refrigeration is rendered singularly perfect. There are minor mechanical details connected with this apparatus, but the general principle is as above stated.

Thus is solved the problem of a process for attaining cold and ice without mechanical aid, and as the inventor says, "Its abounding efficacy is made evident in its freezing of mercury in the open air."—*British Journal of Photography.*

Mississippi River Improvements at Memphis.

In our notice of this work, in the SCIENTIFIC AMERICAN of June 29, we should have stated that all the heavy mattress work, both above and below low water, from 1,000 feet above the mouth of Wolf river to the upper end of Memphis city levee, was built under the personal supervision of Captain Clinton B. Sears, of the United States Engineer Corps. Along this line are situated some of the most valuable commercial buildings, such as cotton compresses, etc.

A Suggested New Use of Photography.

Prof. John Trowbridge, in the May *Scribner's*, calls attention to the importance, from an engineering point of view, of making careful photographs of steel and timber at the point of rupture under a breaking load, suggesting that in this way we may learn something important on the much vexed question of elasticity.

This is a suggestion worthy the attention of our metallurgists, some of whom have made a critical study of the behavior of iron and steel under strains.

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SECONDARY BATTERY.

BY GEO. M. HOPKINS.

Probably no secondary battery can be more readily made or more easily managed than the one invented by Plante. It is therefore especially adapted to the wants of the amateur who makes his own apparatus. It takes a longer time to form a Plante battery than is required for the formation of some of the batteries having plates to which the active material has been applied in the form of a paste, and its capacity is not quite equal to that of more recent batteries, but it has the advantage of not being so liable to injury in unskilled hands and of allowing a more rapid discharge without injury.

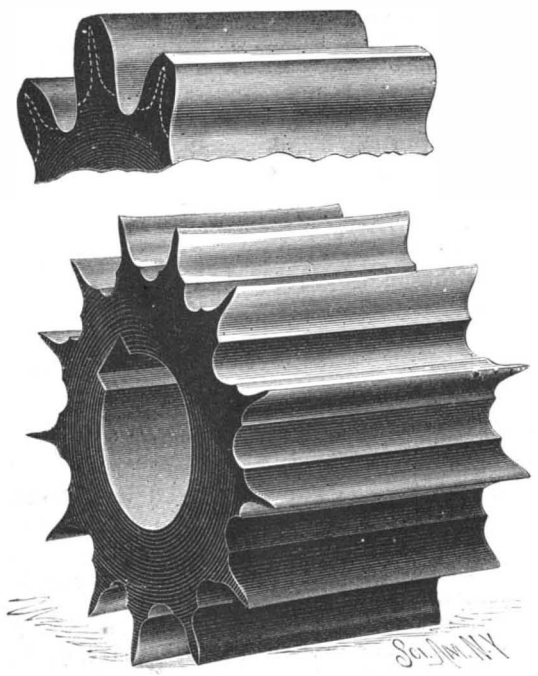
Each cell of the battery consists of 16 lead plates, each 6×7 inches and $\frac{3}{32}$ inch thick, placed in a glass jar 6×9 inches, with a depth of 7½ inches. Each plate is provided with an arm 1½ inches wide and of sufficient length to form the electrical connections. The plates are cut from sheet lead in the manner indicated at 3 in Fig. 1, *i. e.*, two plates are cut from a sheet of lead 8½×14 inches. This method of cutting effects a saving of material. The plates after being cut and flattened are roughened. One way of doing this is shown in Fig. 2. The plate is laid on a heavy soft wood plank and a piece of a double cut file of medium fineness is driven into the surface of the lead by means of a mallet. To avoid breaking the file, its temper is drawn to a purple. After the plate is roughened on one side it is reversed and treated in the same way upon the opposite side. If a knurl is available, the roughening may be accomplished in less time, and with less effort, by rolling the knurl over the plate. Half of the plates are provided with four oblong perforations into which are inserted H-shaped distance pieces of soft rubber, which project about ⅛ inch on each side of the plate. The perforated and imperforate plates are arranged in alternation, with all of the arms of the perforated plates extending upward at one end of the element and all of the arms of the imperforate plates similarly arranged at the opposite end of the element. The plates are clamped together by means of wooden strips—previously boiled in paraffine—and rubber bands. The strips are placed on opposite sides of the series of plates at the top and bottom, and the rubber bands extend lengthwise of the strips.

The arms of each series of plates are bent so as to bring them together about 3 or 4 inches above the upper edges of the plates. They are perforated to receive brass bolts, each of which is provided with two nuts, one for bending the arms, the other for clamping the conductor.

The element thus formed is placed in a glass cell, and the formation is proceeded with as follows: To hasten the process, the cell is filled with dilute nitric acid (nitric acid and water equal parts by measure), which is allowed to remain for twenty-four hours. This preliminary treatment modifies the surface of the lead, rendering it somewhat porous, and, in connection with the roughening, reduces the time of formation from four or five weeks down to one week. The nitric acid is removed, the plates and cell are thoroughly washed, and the cell is filled with a solution formed of sulphuric acid 1 part, water 9 parts.

The desired number of cells having been thus prepared, are connected in series, and the poles of each cell are marked so that they may be always connected up in the same way. The charging current, from whatever source, should deliver a current of ten amperes with an electro-motive force ten per cent above that of the accumulator. Each cell of this battery has an electro-motive force of two volts, and the voltage of the series of cells would be the number of cells × 2. It is a simple matter to determine the amount of current required to charge a given series of cells. For example, a battery is required for supplying a series of incandescent lamps. It has been found uneconomical to use lamps of a lower voltage than 60. It will, therefore, require a battery having an E. M. F. of 60 volts to operate even a single lamp. This being the case, at least 30 cells of battery must be provided, and on account of a slight lowering of the E. M. F. in use, two extra cells should be added. It will, therefore, require 32 cells for a small installation, and the machine for charging such a battery should be able to furnish a current of ten amperes, with an E. M. F. of 75 volts.

To form the battery, it is placed in the circuit of the dynamo and kept there for thirty hours continuously, or for shorter periods aggregating thirty hours. It



CURIOUSLY WORN GEAR WHEEL.

is then discharged through a resistance of 20 or 30 ohms, and again recharged, the connections with the dynamos being reversed, so as to send the current through the battery in the opposite direction. The battery is again discharged through the resistance, and again recharged in a reverse direction. These operations are repeated four or five times, when the formation is complete. It will require from five to seven hours to charge the battery after it is thoroughly formed. It must always be connected with the dynamo as connected last in charging.

Although amateurs may find pleasure in constructing and forming a secondary battery, there is no economy in securing a battery in this way. It is less expensive and less vexatious to purchase from reliable makers.

Locomotive in Motion Struck by Lightning.

Quite a remarkable incident of an express train being struck by lightning while moving at the rate of thirty miles an hour recently occurred on the New York and New Haven Railway, at Stamford, Ct., during a heavy thunder storm. It was shortly before 4 P. M., as the train was whirling through the town that a tremendous bolt of lightning struck the center of the locomotive. The report says: Engineer John Schofield and his fireman felt a severe shock which dazed and half stunned them. Upon being taken from the cab, both were seized with violent attacks of retching. The electric bolt disabled the engine and caused it to come to a stop. The substitution of another engine caused a delay to the train of forty-five minutes. The engineer and fireman soon recovered from the unpleasant consequences of the shock they received. Railroad men who were discussing the incident recently said it was the first time they ever heard of an engine in rapid motion being struck by lightning.

Fig. 2.—ROUGHENING THE PLATE.

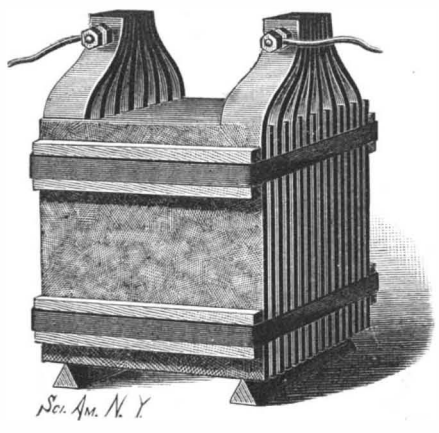


Fig. 3.—PLATES CONNECTED.

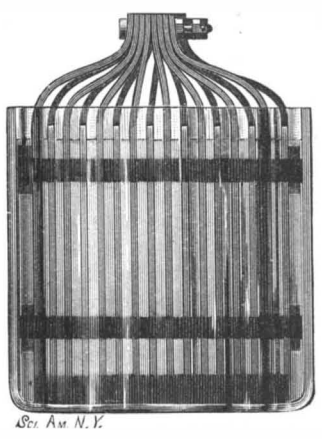


Fig 4.—COMPLETE CELL.

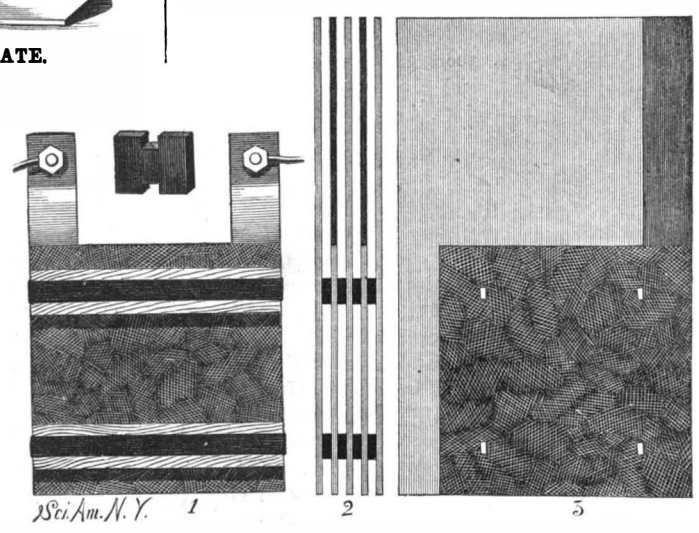


Fig. 1.—PLATES OF SECONDARY BATTERY.

CURIOUSLY WORN GEAR WHEEL.

We illustrate a curious instance of wear in machinery. It is the armature shaft pinion of an electric motor that for four months propelled a street car. The wheel in question, carried by the armature shaft, rotated at a speed of about 900 revolutions per minute. It is interesting from several points of view. It shows forcibly the resisting power of steel. With the teeth worn away until little thicker than a sheet of paper, it was still strong enough to actuate the driving wheels of a heavy car, because, worn as it is, not the least sign of fracture or breakage is perceptible. Again, the curiously perfect shape of the teeth will be noticed, each one preserving the proper shape almost as accurately as if cut on a milling machine. It also illustrates one of the troubles of street car electrical propulsion. The reduction of the high velocity of the armature to a working speed by any of the known forms of gearing has been one of the most difficult problems to solve in this connection. Combination pinions of alternate disks of rawhide or of fiber with steel intermediate disks have been tried, as well as solid metal and various forms of friction and chain gearing. It is too soon perhaps to say that the problem has been solved. The grit caused by the location of the motors under a car and near a dusty roadbed makes the work very severe, and the example shows how soon even steel succumbs to the wear.

A Mountain Electric Railway.

One of the most interesting achievements in modern engineering is the electric mountain railway recently opened to the public at the Burgenstock, near Lucerne. The rails describe one grand curve formed upon an angle of 112 degrees, and the system is such that the journey is made as steadily and smoothly as upon any of the straight funicular lines. The Burgenstock is almost perpendicular—from the shore of Lake Lucerne the Burgenstock is 1,330 feet, and it is 2,800 feet above the level of the sea. The total length of the line is 938 meters, and it commences with a gradient of 32 per cent, which is increased to 58 per cent after the first 400 meters, this being maintained for the rest of the journey. A single pair of rails is used throughout, and the motive power, electricity, is generated by two dynamos, each of twenty-five horse power, which are worked by a water wheel of nominally 125 horse power, erected upon the River Aar at its mouth at Buochs, three miles away, the electric current being conducted by means of insulated copper wires. The loss in transmission is estimated at 25 per cent.

Woolen Looms and Cards.

According to "Babcock's Textile Directory of the United States and Canada," there were in the United States in 1888, approximately, 82,697 woolen looms. Of these there were located in the States of which Philadelphia can be claimed the business center, 30,238, as follows: In Delaware, 40; in Maryland, 136; in New Jersey, 2,044; and in Pennsylvania, 28,018. In the New England States, for which Boston may be considered the wool mart, there were 37,797, viz.: In Maine, 3,781; in Vermont, 863; in New Hampshire, 2,098; in Connecticut, 3,781; in Rhode Island, 7,829; and in Massachusetts, 21,216. In New York State there were located 4,946 looms.

Other sources of demand for wool are found in the hat and hosiery mills of the country. "Dockham's Textile Directory" says there are 228 sets of wool cards, 77 of which are in Pennsylvania, 88 in the New England States, and 63 in New York; and from the latest directory of the hosiery mills of the country there are 654 of these, 194 of which are in Delaware, Maryland, New Jersey, and Pennsylvania, and 149 in the New England States.

THE saw is largely used now instead of the ax in bringing down the giant redwoods in California. The tree is sawed partly through, and then is forced over by wedges.

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MATERNAL INSTINCT IN SPIDERS.

M. L. PIKE.

It is a fact well known to naturalists that mother love in spiders is very fierce and strong for the time it lasts. What a wonderful provision is made for the preservation of the young! The finest swan's down and linen used by a human mother are not more fine and soft than the fabrics spun by the spider to keep her brood warm and impervious to torrential rains or scorching drought.

I will cite an instance in the life of the *Olios leucosus*. She spins no web, but in some out of the way corner lays her eggs and spins a large, flat cocoon of strong, cream-colored silk, as large as a 25 cent piece, in which they are inclosed. If disturbed, she holds the cocoon close to her body with two of her legs, but if not, she fixes it by a mass of fine threads to some safe place and watches it. I saw one fasten her cocoon on a door and wanted to have a good look at it, but on my approach she dashed to her cocoon, cut the threads with her mandibles, clasped her precious burden to her, and was out of sight in less time than I have written it. She roamed around for awhile and then took her station behind a window curtain, and there remained fifteen days motionless. When the eggs were ready to hatch, the mother struck the edge of the cocoon, making a clean cut, and out poured the young. When approached she raised her palpi and strutted about, trying to frighten you, and then huddled up her young ones that swarmed all over her. They remained only a few days with her, and not till they disappeared did she seek food or rest.

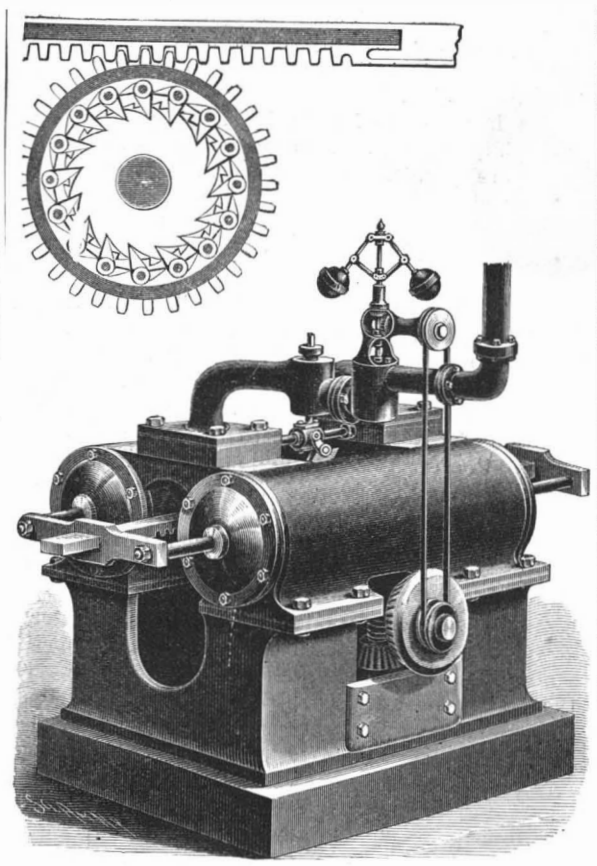
Olios are universal in the African islands of the Indian Ocean, and grow large. It is startling at first to see the great hairy creatures prowling over your walls; but their voracious appetites (especially when the duties of maternity are over) and tenacity of purpose when pursuing their prey render invaluable service to man. The old houses swarm with disgusting *Blattæ*, or cockroaches, from an inch and a half long to less than one-half an inch. I once saw the capture of one of the former by an olios. It was eating a piece of bread, and I was about to kill it when I saw an olios not half its size creeping stealthily along the wall. Being curious to see if the tales were true of its killing such large prey, I left the field to it. Very soon the cockroach's attention was drawn to its deadly foe and it stopped eating. They speak of the fascination of snakes for birds, etc., but it, or whatever the power may be, is equally displayed between these enemies.

The cockroach had plenty of time to escape, but it appeared paralyzed, and sat quivering, its eyes fixed on the advancing olios. When near she rushed at it, whipped it off its legs, and clasped it so tightly it could not entangle her long legs with its claws. She soon began her meal, when I placed a glass over both, and she dropped her supper. Very soon, finding no interference, and the cockroach beginning to stir, she caught it again, legs uppermost, and though I removed the glass, she did not move till only skin and legs remained. After this experience the olios had full liberty to roam round unmolested.

One spider, a *Dolomedes*, carries her cocoon in her mandibles, and when incubation is nearly over, she attaches it to a low bush or dead branch, and makes a good sized, loose web to receive the little ones as they hatch out, and for them to rest in till strong enough to forage round alone, she watching near, till they disappear.

The *Lycosas*, veritably the tigers among spiders, after the eggs are inclosed in their round bag of white or greenish silk, attach it to the abdomen and carry it about with them till ready to hatch out. During the season of maternity they are very savage, and if they had the power to bite that they have the will, they would be formidable foes. The young swarm all over the mother, and she carries them about with her for several days. In some cases she falls a victim to her devotion, as the little creatures have such voracious appetites they devour their parent.

One of the *Epeiras* hangs her cocoons, little triangular ones with pointed tips, across her web, and every insect, when she has sucked the life out of him, is incased in a silken shroud and hung alongside the cocoons, till what with these, dust, straws, and other debris, it is impossible to distinguish the eggs. The mother places herself in a corner of the web, or in a cozy nest in a rolled leaf near, but so surrounded by silken burglar alarms that not



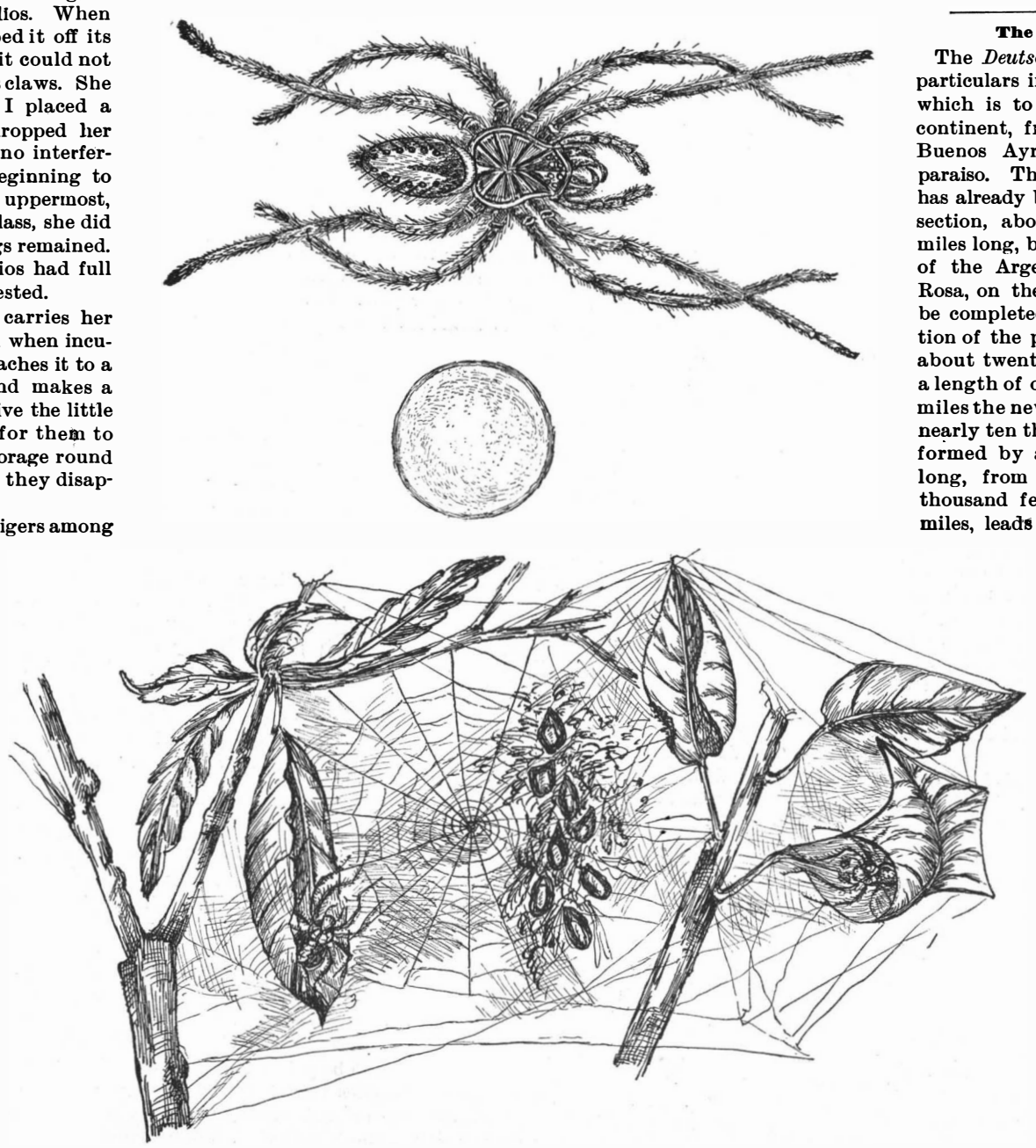
STRAUB'S STEAM ENGINE.

the smallest insect can alight without sounding its death knell.

I do not know of any large spider that allows the male to approach her when tending either cocoon or young. His life would end there and then if he molested her, as the females have no scruples about devouring their spouses if they interfere in household matters. He may construct a house for himself, but it must be placed at a respectable distance from hers.

Open the head of a thistle, wild carrot, or golden rod, and if you see a few threads on top, you will surely find a tiny nest inclosing white or yellow eggs. They belong, probably, to a spider of the genus *Altus*, some of which do not exceed a quarter of an inch in length. Small as is the mother, she will show fight, rise on her hind legs, and raise her palpi, and only when you try to catch her does she leap down from her home.

I could recite numerous instances of spider love for the young, but I have said enough to prove how strong is the feeling of maternity even in these insignificant creatures, implanted to insure the propagation of their species.



THE EPEIRAS.

AN IMPROVED STEAM ENGINE.

The accompanying illustration represents a steam engine which avoids all dead points, and transmits the power directly to the main driving shaft. It has been patented by Mr. Alfred H. F. Straub, No. 40½ Buena Vista Street, Los Angeles, Cal. This engine has two cylinders placed alongside of each other, whose piston rods extend through both ends of the cylinders, the outer ends of the piston rods being connected by transverse beams, in the middle of which is secured a longitudinal bar sliding in suitable bearings on the inner side of the cylinders. On the under side of this bar are rack teeth meshing into a gear wheel, as shown in the sectional view, the gear wheel rotating loosely on the main driving shaft. On this gear wheel are pivoted a number of double pawls arranged in a circle, each having two wings standing at right angles to each other, one wing engaging a ratchet wheel secured to the main driving shaft, and the other wing engaging a ratchet wheel on the hub of a bevel gear wheel rotating loosely on the main driving shaft, the latter gear wheel also transmitting its motion, through other gears, to the main driving shaft on each reverse motion of the piston rods. In the steam chests on the cylinders are slide valves connected by a valve rod, a lever being pivotally connected with the valve rod, while a bar having a reciprocating motion derived from the pistons operates on the lever to shift the slide valves, a cut-off valve being connected with the steam chest and controlled by this bar. The valve stem carrying the cut-off valve has a forked arm provided with friction rollers, the reciprocating bar controlling this valve having guideways for the rollers. The positions of the slide valves in the steam chests are not changed until the pistons near the ends of their strokes, so that the exhaust steam in the front of the piston can freely escape, and the guideways are so arranged that live steam is cut off when the pistons have made about two-thirds of their strokes.

The Andean Railway.

The *Deutsche Bauzeitung* gives some particulars in regard to the new railroad which is to cross the South American continent, from the Atlantic Ocean at Buenos Ayres to the Pacific at Valparaiso. The greater part of the road has already been built, but the mountain section, about one hundred and fifty miles long, between Mendoza, on the side of the Argentine Republic, and Santa Rosa, on the Chili side, still remains to be completed. At Mendoza, the elevation of the present road above the sea is about twenty-five hundred feet, but in a length of one hundred and twenty-four miles the new line ascends to a height of nearly ten thousand feet. The summit is formed by a tunnel, about seven miles long, from which a descent of seven thousand feet, in length of thirty-two miles, leads to Santa Rosa, where connection is made with the existing road to Valparaiso. It is expected that the line will be finished by the end of 1890, with the exception of the tunnel, which will take two years longer. During the construction of the tunnel, however, the road will be open for traffic, passengers and goods being transferred over the mountain.

"IF I gave you a pound of metal and ordered you to make the most out of it, what kind of metal would you select?" asked a well known jeweler. "Gold, of course," was the prompt reply. "I'd prefer a pound of steel," said the jeweler, "and I'd have it made into hair springs for watches. A pound of such springs would sell for an even $140,000."

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Milk and Some of Its Products.

BY JOHN CROWELL, M.D.

Milk is the most popular, the most simple, as well as the most nutritious of any of the articles of food used by the great mass of human kind. It is easily attainable, and it contains the necessary elements for sustaining life. This is especially true of cow's milk, containing carbon, oxygen, nitrogen, and hydrogen, combined in fairly equal proportions in the form chiefly of water, casein, albumen, fat (or butter), lactose, and numerous salts. Having these chemical qualities, it is possible to sustain life for a long time upon an exclusively milk diet. This, however, soon becomes wearisome, and gastro-intestinal derangements are apt to result after a few weeks. In this exclusive use, there often follows a disagreeable nausea, and the smell and taste of the milk causes great loathing.

This disagreement is caused from the fact that there is too much nitrogenous matter in proportion to the carbo-hydrates, and in order to obtain sufficient carbo-hydrates, too much protein is taken, which greatly interferes with the process of digestion. But, although an exclusive milk diet seems essential in the first years of human life, it is not sufficient for adults. It is usually omitted from the dietary of athletes in process of training, and in many persons it causes derangement in digestion, resulting in constipation and other disagreeable conditions.

On the other hand, it is often used with the most satisfactory results in cases where no other form of diet can be tolerated, and in almost any febrile condition its use is of the first importance, especially where the nitrogenous metabolism is great. The time required for the complete digestion of milk, in its normal process, is three hours. Oftentimes the milk of the cow disagrees with the stomach, and, especially with infants, cannot be tolerated. This is owing to a variety of causes, as contamination by disease germs from the cow, poisonous foods eaten by the cow, extraneous disease germs, pollution of the milk by the dealer, souring or decomposition of the coagula formed in the stomach, when the gastric juice fails to disintegrate the casein within a reasonable time, owing to the weak state of that organ.

Whenever, therefore, a child is unable to retain the milk that is ordinarily given to it, inquiry should be made into the sources from whence the milk is obtained, and it will often be found that the trouble lies with the habits of the cows. These animals, especially in the dry weather of late summer, often seek low places in the meadows and eat poisonous herbs and grasses, and sometimes the simple change in the character of the feed will be a sufficient cause to affect the milk and render it unfit for use.

The most evident differences between human and cow's milk are that woman's milk is sweeter, it contains less butter and casein, and the casein forms in much smaller clots and is more quickly dissolved. The milk of the mother is normally alkaline, while the reaction of cow's milk varies, and it may be acid.

Goat's milk, because of its richness in fat, disagrees with many, occasioning nausea and vomiting. Its disagreeable odor is also objectionable, and infants do not thrive under its use. Mare's and ass's milk contain less nitrogenous matter and fat and more sugar than cow's milk—that of the ass being very sweet and easy of digestion, although it sometimes causes diarrhœa if taken alone. When milk is boiled, a thin scum of albumen appears upon the surface, which, when removed, is quickly replaced by another. Boiling expels about three per cent of gases, and the loss of oxygen diminishes the formation of lactic acid, and consequent souring. It somewhat affects the taste of the milk, and its use for any length of time produces constipation.

Should raw milk be given to infants?

This question has given rise to much discussion, and high authorities sharply differ upon the matter. We certainly know that, in many cases, pure milk does no harm, and that children thrive upon its constant use. Boiling the milk arrests the development of germs and fungi, with which it may have been contaminated, and thus it may prevent occurrence of certain diseases, and the process of souring and coagulation is certainly retarded by boiling.

The quality of milk depends largely upon the breed and proper care of the cows. Much neglect in this direction is common among the producers of milk. There should be absolute cleanliness in handling everything belonging to the care of the herd, as well as in the process of milking and the use of the vessels for receiving the lacteal fluid. Sometimes the milk is put at once into glass bottles, tightly corked. The pails and cans should be carefully washed, and often insured from germ poisoning by scalding with boiling water. In large establishments, there should be an inspection of the sanitary surroundings, either by a physician or by an expert in hygienic science. The condition of the yards and stables should be thoroughly inspected, and care should be taken that the animals are not fed upon swill and garbage, and that certain kinds of food should be avoided, especially such substances as will give to the milk a disagreeable odor, like garlic, cabbage, etc. It has been suggested by good authority that there may be danger of tuberculous disease by drinking milk from cows having "pearl disease," which is believed to be analogous to tuberculosis, but there is really no authentic case where this result has been produced in man, although lower orders of animals are thus infected. This is a matter for further investigation, for certainly the milk of animals having the above named disease is below the normal standard of nutrition.

The inspection of milk by legal authority is of great importance, and in many States the requirements are specific. In New York, the specific gravity is ascertained by the lactometer; in Massachusetts, Rhode Island, and Maine, a chemical analysis is required. The normal average specific gravity allowed is 1·030+.

The total quantity of solids in milk should, according to Letheby, amount to fourteen per cent. Such inspection has been made necessary because of the adulteration of this important article of food. The most popular and simple form of adulteration is the addition of water. In order to give the milk a thickened look, after this dilution, chalk or flour is sometimes added. Bicarbonate of sodium and salicylic acid are often added, to prevent souring. If milk inspectors are honest men, and understand their business, it is a very easy matter to detect any of these base frauds upon the public.

The most popular products from milk are butter and cheese—those well known condiments and appetizers all over the world. Cheese is the separated casein of the milk, and it forms a highly nutritious article of diet, and, in some countries, where meat is scarce and dear, the people consume large quantities of cheese, to supply the nitrogenous elements of diet, using the heavy and less highly flavored of the cheeses. The wealthier classes use as a condiment the more highly flavored cheeses, such as the Rouqefort, Edam, Cheshire, etc. Taken in moderate quantities, these cheeses aid in promoting digestion, and are very palatable to the epicure.

Butter is made from cream by the mechanical rupture of the albuminous follicles which inclose the fat globules, which then adhere together into small masses. Butter contains six neutral fats, four of which being volatile, give to it taste and odor. The adulteration of butter is accomplished by dealers, by beating it up with water, and by adding other fats, especially suet and oleomargarine. Butter will not support life for any considerable length of time when taken alone. Taken in connection with other food, it is a highly digestible and nutritious, and often fattening, food.

Fermented, or "rancid," butter causes violent gastric derangement, and it is therefore important that it be thoroughly worked with a spatula, and frequently washed, and seasoned with at least two per cent of salt. In California they have an ingenious way of ridding butter of a rancid taste, by subjecting it to the action of an electric battery. The butter is melted in a tub, and the poles of an electric battery, incased in flannel, are placed in it, so that a current of electricity when passed through the butter from one pole to the other, determines a collection of the acids which caused the rancid taste, at one or the other pole. In striving to reach the pole, the acids sink into the flannel, and may thus be removed.

Condensed milk, which is so much used for the food of infants, is prepared by slowly evaporating the water of milk by moderate heat. There are two varieties, the plain, which is condensed to about one-fourth of its bulk, and superheated, and to which no sugar is added, and the stronger variety, which is more condensed, and to which cane sugar is added in excess, yielding about forty-five per cent of sugar among its solid ingredients. This excess of sugar prevents the decomposition of the milk, and it will keep fresh for many hours after the can has been opened.

Condensed milk, because of its convenient form, is used largely among the poorer classes, and infants seem to thrive well for a time. But, although they often grow fat, they develop poorly, and are less able to resist disease than children who use the pure milk.

According to Heubner, condensed milk has been used successfully in dysentery, and is a preventive of that dreaded disease of summer—scurvy.

Koumiss is another form in which milk is prepared for dietetic and medicinal uses. This is a fermented milk, prepared in a peculiar way, and used largely by the Russians. It is mildly stimulating, and sometimes intoxicating, and is used in cases of phthisis and intestinal derangements, and other wasting diseases. Its virtues have, no doubt, been exaggerated, the cures having been due more to the favorable climate along the steppes of Russia, where the patients under treatment resort, than to the curative qualities of the specific. The koumiss has been introduced into this country, where its curative qualities have been highly lauded. It is strongly diuretic, quenches thirst, increases the cardiac force, improves the muscular tone, aids general nutrition, and beautifies the complexion.

This preparation is made from cow's milk, by various firms in the United States, and preserved in glass bottles, but it does not contain the peculiar flavor and the essential qualities belonging to the native article, which is made from mare's milk, and kept in smoked-out leather bottles, and subjected to various manipulations, which cannot be imitated, even by Yankee ingenuity.—*Popular Science News.*

American Newspapers.

The American Newspaper Directory for 1889 has made its appearance. George P. Rowell & Co., New York, publishers, 1536 pages. Price five dollars. A comparison of the 1889 edition of the directory with that for 1888 shows a net increase of 797 in the number of newspapers. The book for 1889 contains a description of 2,685 newspapers which were not in the previous edition, but there were 1,888 newspapers in the last year's edition of the book which died or disappeared from the newspaper world during that year.

The total number of periodical publications now issued in the United States and Canada is 17,107.

In frequency of issue they are divided as follows:

1. Weekly	12,791
2. Monthly	1,998
3. Daily	1,584
4. Semi-monthly	241
5. Semi-weekly	222
6. Quarterly	127
7. Biweekly	63
8. Triweekly	44
9. Bimonthly	37
Total	17,107

Out of the total number of 17,107 publications, 11,290, or nearly two-thirds of the whole, are rated as having an average issue of less than 1,000 copies.

When divided into classes indicating frequency of issue, it is found that the total circulation, 34,799,500 copies, is distributed as follows:

Weekly	19,588,000
Monthly	7,472,750
Daily	5,713,750
Semi-monthly	1,209,250
Quarterly	315,750
Semi-weekly	271,250
Biweekly	134,250
Bimonthly	54,000
Triweekly	40,500
Total	34,799,500

New York has the largest number of publications and the largest total issue.

What is a Fire?

A curious point of law, bearing upon the responsibility of insurance companies, has just been decided in the Paris Law Courts (5th Chamber of the Civil Tribunal of the Seine), at the suit of the Countess Fitz-James *vs.* the Union Fire Insurance Company, of Paris, by which it is ruled that insurance companies must indemnify all losses sustained by an assured caused by fire, even in cases where no destruction of premises has been caused by conflagration. The Countess Fitz-James insured against fire, in the above company, all her furniture and effects for 558,000 francs, and in her policy, under Art. 7, were mentioned her jewels, among which figured specially a pair of earrings, composed of fine pearls, valued at 18,000 francs. On April 17, 1887, one of these earrings, which had been placed on the mantelpiece, was accidentally knocked down by the countess and fell into the fire, where it was consumed, notwithstanding every effort made to save the jewel.

Expert jewelers were called in by both parties to estimate the intrinsic value of the property destroyed, and 9,000 francs was stated to be the amount, less 60 francs for molten gold rescued from the ashes. The insurance company refused to pay for the burnt pearl on the ground that there was no conflagration, that the fire which consumed the object was an ordinary fire; in other words, that there was no fire, and that the company was not responsible where combustion had only occurred by the ordinary use of a grate for heating purposes. The court, however, rejected this, and ruled that "the word *fire*, in matters of assurance, applied to every accident, however unimportant such accident may be, so long as it is caused by the action of fire." It was, therefore, ordered that the Union Company should pay to the Countess Fitz-James the value of the jewel, less that of the gold recovered, viz., 8,940 francs and costs.—*Irish Law Times.*

Red Spider.

Some interesting experiments have been carried on at Amherst by S. T. Maynard, the horticulturist of the Massachusetts Agricultural Experiment Station, which indicate that evaporated sulphur is not only a good fungicide, but that it is an excellent remedy against *Tetranychus telarius*—the common red spider. The remedy consists in heating a kettle of sulphur for three or four hours twice or three times a week to nearly boiling point in the room with infested plants, care being taken not to heat it so that it will take fire, but evaporating enough to fill the room with visible vapor and to make the sulphur odor perceptible. So perfect a remedy is this claimed to be, that infested plants exposed for a few hours in the room where sulphur is used are said to be completely freed.

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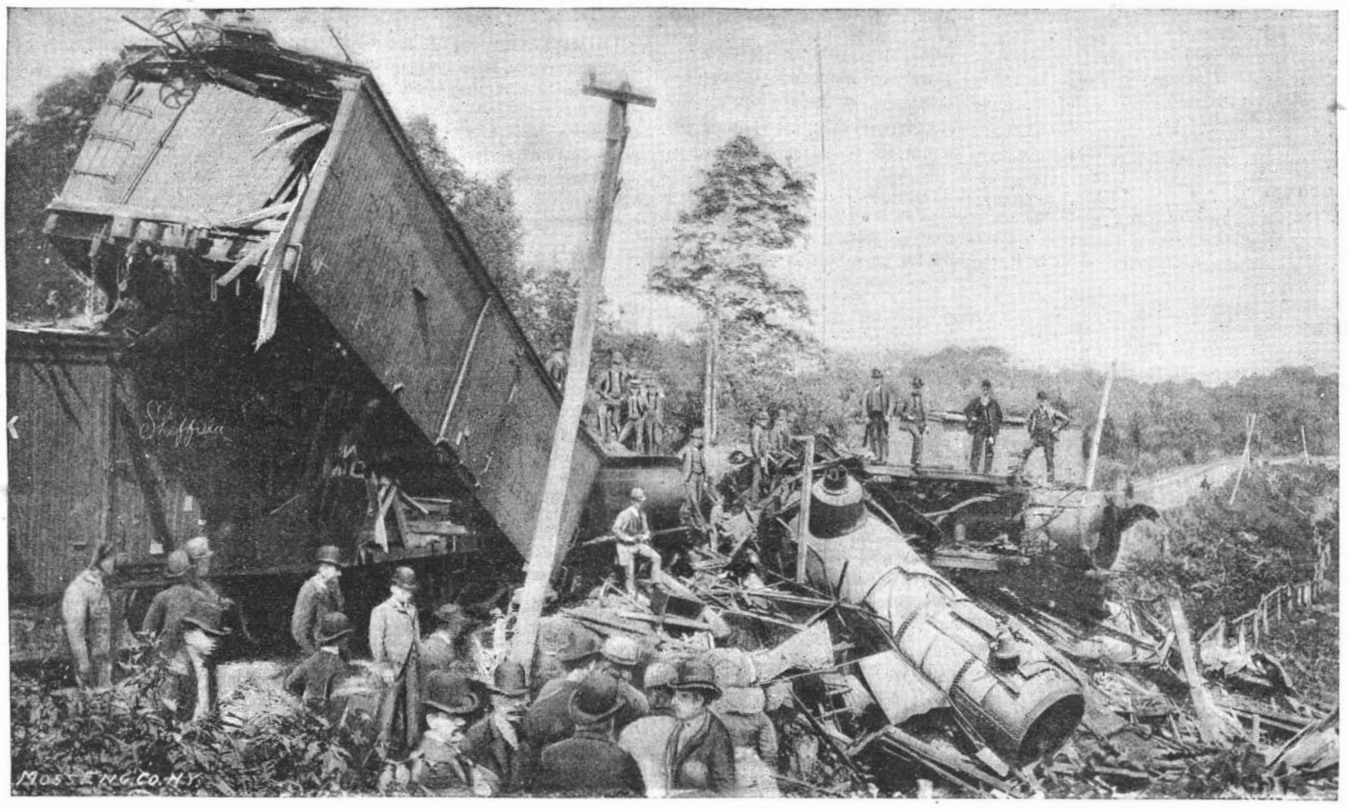
ACCIDENT ON THE HOUSATONIC RAILROAD.

A frightful railroad accident recently occurred on the main line of the Housatonic Railroad near Trumbull Church, resulting in the death of several of the train hands. Two freight trains came into collision while running on the same track in opposite directions at a high rate of speed. The terrible wreck that was the result of this collision is well understood from the photograph. One of these trains was run in violation of orders, and the result, sad though it is, is attributable alone to this fact. The south-bound train was a regular through freight train from Albany, and was in charge of Conductor Curtis. It was run by mogul engine No. 29. The north-bound train was an extra, and was drawn by the mogul locomotive No. 10, and was in charge of Conductor Van Horn. This train had received orders to run to Stepney, and side-track at that point until the Albany freight had passed. The Albany train was ordered to proceed to Stepney and await further orders there. Arriving at Stepney the telegraph operator was not to be found, and, not knowing what course to take, the engineer decided to proceed. The accident took place only shortly after the train was put under way, at a place called Trumbull. There is a sharp curve at this point of the road, and the two trains were concealed from one another by a high bank. Engineer Cook of the north-bound train, feeling sure of his track to Stepney, was driving his locomotive at a high rate of speed. When the crash came he was at his post, and was instantly killed, the lower part of his body being forced against the tank and being mangled in the most terrible manner. The two locomotives, both new ones, of the Rogers make, are complete wrecks, and were found lying across the track, the two prows jammed together and the piston rods twisted. The scene was a terrible one, and the wreck of the trains complete. In spite of every precaution a railroad company can take, it seems that absolute safety can never be reached. A little carelessness on the part of some one, the absence of a telegraph operator, the misunderstanding of an order, may result in terrible destruction of life and property. These accidents bring always their own punishment to the company, and if they do not effect radical cures of the evils themselves, it is because the evil is inherent, because man is not infallible, because rules have their exception, because the conditions of traffic are not always normal.



RAILROAD ACCIDENT ON THE HOUSATONIC RAILROAD.

Magicienne.

The cruiser Magicienne made another attempt to pass her four hours' trial under forced draught at Portsmouth on June 8. After the expiration of the third hour the boilers primed to such an extent that it was deemed useless to continue the run. Though the engines worked admirably, the mean results of the three hours failed to quite come up to the contract power of 9,000 horses. The average revolutions were 138, and the power developed by the starboard engine was 4,339, and by the port engine 4,441, making a collective indicated horse power of 8,780. During the trial four runs were made on the measured mile, which gave a mean speed of 18·85 knots. The pitch of the propellers is greater by 6 inches than in the case of the sister ships, and the result shows that with the guaranteed power there would be no difficulty in realizing 19 knots, the designed speed. So far as the trials of the "M" class of cruisers have proceeded, they have shown the necessity of providing them with greater boiler power.

BENJAMIN JOHNSON, it is said, owns a farm in Rush Valley, U. T., upon which he has just discovered a mine of natural shoe blacking. An analysis of this peculiar material shows that it contains 16 per cent carbon, 34 per cent aluminum, and the remainder clay. When taken out the material is moist and soft, and when used as a shoe blacking produces a fine polish, which is not easily destroyed.

Our New Navy.

The navy department has issued its proposals for the two 3,000 ton steel cruisers, authorized by the last Congress, the bids to be opened August 22. They are to have a maximum speed of at least 19 knots an hour, and as much more as the contractor can get under the stimulus of an award of $50,000 for each quarter of a knot, with a penalty of the same amount for each quarter of a knot deficit. They are to be built according to plans provided or adopted by the navy department and completed in two years, at a cost of $1,100,000 each. Proposals are divided into five classes: 1. Hull and machinery in accordance with the plans and specifications of the Secretary of the Navy. 2. Hull and machinery after the plans and specifications of the contractor. 3. Hull according to the plans of the department—engines, boilers, and appurtenances of any design not exceeding in weight or occupying more space than those planned by the department. 4. Engines, etc., after the naval designs, and the hull after the designs of the contractor. The arrangements for the accommodation of all machinery, coal, armament, fittings, equipments, and stores complete, must be for the same articles and equally convenient and commodious as those contained in the department's plans and specifications. No offer for more than one vessel, complete, including hull and machinery, is to be embraced in the same proposal; but the same bidder may propose separately for one or both of the vessels, and under one or more of the four classes of proposals.

The plans adopted have been agreed upon by a board of officers, consisting of Commodore Sicard, Commodore Schley, Engineer in Chief Melville, and Chief Naval Constructor Wilson. The type on which the new vessels are to be constructed is of the Medusa and Medea class, two of the latest of the fast British unarmored cruisers, and the navy department has concluded to allow the contractors to take either their own plans for hull and machinery or those prepared by the navy department. But the contract speed, or better, must be shown, or else the vessel will not be accepted by the navy department.

Like the three 2,000 ton vessels advertised for recently, the two new cruisers of the 3,000 ton type will be armed wholly with rapid-firing guns, which seem to be the latest improvement for new vessels of war. These will be of the 6 and 4 inch caliber.

The board is now engaged in working out the scheme of the 7,500 and the 5,300 ton vessels authorized by Congress several years ago. It is expected that the work will be in shape to admit of the vessels being advertised for in the course of the next few months. In regard to the construction of the submerged cruiser or monitor, from plans prepared by the Hon. John R. Thomas, the board is now considering the advisability of altering the plans somewhat from those originally presented. The law provides that this vessel shall be built from plans furnished by Mr. Thomas, but upon a careful examination of the drawings it has been found that there exist several discrepancies. Whether there is authority to change the plans has not yet been decided.

Nothing has been done in relation to the construction of the new dynamite cruiser. This was to be contingent upon the success of the Vesuvius, but so far the latter vessel has not performed satisfactorily all the requirements of the contract. There is some trouble with the mechanism of the dynamite gun, and until this is satisfactorily adjusted nothing toward a final acceptance of the vessel by the government can be entertained. The Vesuvius, in addition to showing a certain speed, must also exhibit to the satisfaction of the trial board that the guns are in every way suited for the uses of the ship and have been thoroughly tested and adjusted. So far this has not been done.—*Army and Navy Journal.*

Shall We Make Our Own Linen?

The interest aroused as to linen manufacture in this country bids fair to increase rather than diminish. As well known, the chief difficulty hitherto met with by American experimenters in this direction has been in preparing the flax after it has been gathered. A new and quick process of doing away with the tedious retting method and the labor of scutching, which involved a long period of preparation and necessitated for woven cloth the lengthened purgation commonly called bleaching, is thus described by the *Haberdasher:*

"The process is known as the Boyce process, and, like very many revolutions in industrial matters, it is so simple that it can hardly be comprehended except by witnessing its operations. Instead of three to five weeks' time expended in retting, the whole operation of retting occupies but five minutes, and instead of discoloring the fiber, its naturally white character is preserved, and the fiber produced is of much greater strength than that by the old process, is as fine, white, soft, and flexible as raw silk, and may be spun and woven upon silk machinery. There is no labor of scutching and no tearing or waste of fiber, while the tow is of greater value per pound than any in the market prepared by the old processes. The process has no destructive chemicals employed in it, no potash, soda, chloride of lime, or acids in any form—nothing but a preparation of linseed oil in a condition to be taken up by the fiber, which, in the short space of five minutes, is thoroughly freed from the gum and woody matter, and left fine, soft, and white. This treatment gives the fiber an increased oily nature, with much greater strength than by the old processes, while the fiber is flexible and readily spun and woven on silk machinery. These are the facts as far as at present developed, and newspaper argument is that the new discovery will open a royal road for flax cultivation and linen cloth manufacture at the hands of American enterprise. Experiments are now going forward; but it behooves us to withhold our sentiment and patriotic fervor until the many unknown quantities hidden away in the intricacies of the problem have been put upon the board and scientifically wrestled with. While the matter is under consideration the following items will prove of interest: During 1887 there were imported into this country of flax, hemp, and jute fibers and manufactures thereof about $33,800,000, producing a revenue of $9,500,000. Of the principal amount about $3,800,000 would represent the value of twine, thread, yarn, and raw flax and hemp, and the remaining $30,000,000 is divided between linen cloths of all kinds ($13,500,000 in value), jute and other fibers ($9,000,000), burlaps ($3,750,000), bagging ($1,000,000), and embroideries, laces, and miscellaneous articles the balance."—*Bradstreet's.*

SACCHARIN is regarded by a French writer (*London Lancet*) as a valuable antiseptic. A strength of 1 to 500, as an addition to mucilaginous and other solutions, prevents the formation of low organisms. Thus a valuable, inexpensive dentifrice may be prepared by simply dissolving saccharin in water, to the proportion of six per cent. A teaspoonful of this in a half pint of water forms an admirable antiseptic mouth wash. In cases of malignant or other disease of the stomach, requiring the washing out of that organ, a solution of saccharin of the strength of two per cent will be found very suitable.

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RECENTLY PATENTED INVENTIONS.

Engineering.

CENTRIFUGAL GOVERNOR.—Henry L. Berger, Vermilion Parish, and Edouard Noel, Abbeville, La. In this governor a valve eccentric is pivotally connected with a pulley on the main shaft, and has a slot through which the shaft passes, a second eccentric being pivotally connected with the first one and mounted loosely on the main shaft, a weighted arm pivoted on the pulley controlling the action of the second eccentric, the device being designed to cut off or supply steam with greater accuracy, and lock in every position, while of sufficient strength to work an unbalanced valve.

Railway Appliances.

AIR BRAKE. — James M. Maxwell, Pittsburg, Pa. The cylinder connected with the main supply pipe holds a sleeve and has a screw for regulating the throw of the sleeve, a piston connected with a slide valve for operating the brakes being held to slide in the sleeve, the device admitting of the brakes being applied by an operator independently of the engineer's valve.

RAILWAY SIGNAL.—James C. White, Sewickley, Pa. This is an electrically operated signal, in which the track is divided into sections insulated from each other, four contact rails being arranged in pairs in each section and connected together and to the track rails of the next section, one pair of contact rails being opposite the joints of the sections, while suspended from the locomotive are hangers in which are contact wheels, wires extending therefrom to a bell and battery.

Agricultural.

CORN PLANTER.—James R. Patterson and Marshall T. Foster, Madison, Kansas. This invention is designed to afford a simple and effective check row attachment for corn planters, an improved device for reciprocating the seed drop bar, and means for throwing the marker out of engagement with the ground when desired, the invention covering various novel features and combinations of parts.

Miscellaneous.

BAG FASTENER. — Robert Wilson, Grubville, Mo. This a device designed to effectively and rapidly close and lock the mouth of a bag when filled, and consists of two flat members with their adjacent edges recessed, the members being hinged together at their rear ends, and having a fastening for readily connecting the two forward ends.

GRAIN DRIER.—James Hill, Newark, N. J. This drier has a series of heating cells extending across a closed drying chamber, and arranged in horizontal rows, a perforated pipe being arranged under each heating cell, while a main exhaust pipe outside of the drying chamber is connected to each of the perforated pipes, whereby the moisture is exhausted as rapidly as it escapes from the grain.

BAKER'S PEEL.—Gustav A. Naumann, New York City. This device consists of a wooden blade having a recess in its upper end for a handle, and transversely extending grooves in opposite sides, with metal ribs secured in the grooves to prevent the blade from warping.

ANIMAL TRAP. — Augustus Brawn, Pleasant Hill, Neb. This is a device for catching rats and mice and other small animals, the trap being automatic and the dropping apparatus securely fastened until the animal has passed so far into the trap that retreat is impossible.

BRAKE FOR BABY CARRIAGES.—Isaac Levy, Newport, R. I. This invention provides a ratchet collar for the hubs of the carriages, formed in two hinged parts, with a fastening for holding the collar clamped to the hub, and combining various novel features designed to afford a simple and effective brake.

CORSET. — Lucy J. James, Pomona, Cal. This invention provides a corset having combined therewith a shoulder brace, skirt supporter, and breast forms, and which may be worn as an ordinary corset or a skeleton corset for invalids' use, its make being such that any or all of the attachments may be conveniently and expeditiously applied or detached.

WAGON BRAKE. — Leslie Wetherbee, Clayton, Mich. This is a brake specially intended for the front wheels of wagons, the invention covering a novel construction and combination of parts whereby the wagon, when passing down an incline, is automatically braked from the neck yoke, and the brake is thrown off automatically the moment the horses begin to pull on the doubletree.

GATE LATCH. — George C. Loar, Atchison, Kansas. This latch consists of a socketed frame or case having a cavity fitted to contain a ball, which rides forward under a hole in which is placed a pin, the pin being supported on the ball, so that as the staple enters the cavity or recess, it will push back the ball, permitting the pin to fall through and secure the staple.

INKSTAND.—John J. Hoey, New York City. This inkstand has an automatically closing cover to prevent the evaporation of ink, the cover being pivoted to the stand and weighted below to close the cover, while there is a top projection for opening the stand in the act of dropping the pen.

TYPE WRITING MACHINE. — Arthur Grundy, Whitestone, N. Y. This machine is designed to expose the line of print after each impression made by the type arms, so that the operator will immediately detect any error, the exposing of the line being effected by mounting the inking ribbon upon a tilting frame which is raised to printing position at every throw of the type arms.

WIRE BARREL HOOP. — Edward C. Gordon, Chetopa, Kansas. This hoop is composed of a length of steel wire wound to form a number of strands, the ends being locked, and the body of the hoop being held in place at intervals by bands, preferably of hoop iron, the metal being preferably galvanized, and making a light, strong, and cheap hook.

PACKAGE HEAD.—Isaac J. W. Adams, Laurel, Del. This is a new article of manufacture for the heads of packages to be used with fruit and garden truck, consisting of two pairs of slats having curved ends and secured to each other at right angles to each other, making a head which may be subjected to extreme changes of temperature or humidity without any injurious effect.

DIFFUSION BATTERIES. — William Golding, New Orleans, La. These are batteries for extracting sugar, the cane being sliced or cut and thrown into a series of cells or tanks, this invention providing cells or tanks for batteries in the form of cast iron or other suitable cylinders bored out and fitted with pistons and heads, whereby an apparatus is made that will provide for perfect circulation for heating the fluid in each tank, and for pressing out the last of the water.

RUNG SOCKET PLATE.—George Hoepfner and Henry Wuest, New York City. This is a combined rung plate and socket, designed to retain the rung at all times in perpendicular position, while strengthening the body piece and serving to tie it to the floor of a truck, for which the device is especially adapted.

TOUCH REGULATOR FOR PIANOS. — Carl R. Elias, Chicago, Ill. This device consists of a spring secured to each action lever, and of an adjustable sliding bar adapted to engage the free ends of the springs to increase their tension, whereby the resistance of the action may be increased or decreased at will to adapt the piano to a heavy or light touch.

LABELING APPARATUS. — Eliab H. Faulkner, Deposit, N. Y. This is a labeling and pasting apparatus for applying labels to bottles or packages, and has a pasting table, paste cylinder, label carrier, and label holder, arranged upon a base, with a flange upon the pasting table forming a paste receptacle with which a perforated plate and pad reciprocate.

ACOUSTIC TELEPHONES. — Henry P. Jones, New York City. This invention covers an improved diaphragm designed to soften and gather the spoken sounds, the diaphragm consisting of a piece of fabric having strands or cables of greater strength than the ordinary woof and weft threads of the fabric woven in it, the strands or cables intersecting each other at the center to form a support for the button and line wire.

HOISTING CAGES. — Hugh Murray, Sparta, Ill. This invention covers an automatic dumping attachment for hoisting cages such as are employed in mines, rolls or wheels being supported at the sides of the cage, while segmental arms carried by the platform are arranged to rest upon the cage rolls or wheels, means being provided for locking the platform to the cage.

TRAVELING BAG.—Alfred P. W. Seaman, New York City. This bag has a frame composed of three independent bent members pivoted together at their extremities, in combination with an attached flexible body, and may be used as a small hand bag or converted expeditiously and conveniently into a valise of larger capacity.

BASE FOR FENCE POSTS.—William H. Thomson, New York City. This invention provides a fence post base having detachable anchor cross pins which project laterally from the base into the ground and interlock each other, thereby preventing them from being displaced and firmly holding the base in position.

SCALE MEASURE.—William Cook, New York City. This invention relates to that class of rules in which provision is made for adjusting them for use as a square or bevel, the object being to improve the construction of the adjusting devices, to simplify their operation, and reduce the cost of production.

FOUNTAIN PEN. — John D. Bray, Montreal, Quebec, Canada. This is an auto-pneumatic pen, being self-charging and retaining its charge by pneumatic pressure, having a flexible bulb, by pressing upon which the writer will be enabled to retain control of the flow of ink, while the reservoir can always be readily filled by means of the same bulb.

BUCKLE. — William J. Walters, Prospect, N. Y. This invention relates to suspender and similar buckles having a hook or loop to receive the suspender straps, and consists in a novel construction whereby the ring which engages with the hook or loop is restrained from dropping off or becoming unintentionally detached, the invention being an improvement on former patented inventions of the same inventor.

SNOW SHOE.—Henry Watson, Donald, British Columbia, Canada. This shoe has a wooden body with central longitudinal opening spanned by flexible supports, with an adjustable toe strap containing loops and plates secured to the body, and heel strings passing through the plates and the loops of the toe strap.

FLUSHING SYSTEM FOR DRAINS AND SEWERS.—Hiram W. McDonald and Thomas W. Shunk, Bucyrus, Ohio. This invention consists of a system of waste water pipes leading to a common tank or receptacle, which is allowed to permit its accumulated water or contents to be instantaneously discharged upon the opening of a valve in the tank.

SEWING MACHINE. — James Heggan, Perth Amboy, N. J. This machine has a pivotally mounted vibrating head, the needle bar carrying the needle sliding in the head, with a looper shaft, and other novel features, making an improved machine for the production of "French vein" or hemstitch.

BUILDING BLOCK. — John A. Missud, New Orleans, La. This is a block to be used in the walls of sewers, buildings, arches, etc., and is made of clay, iron, or other suitable material, formed with parallel side walls and transverse diagonal partitions cast integral therewith, forming parallel diagonally disposed chambers opening in the sides and ends of the block.

HAND REST.—Henry F. Kretzer, St. Louis, Mo. This rest has a flat body portion with notches in one end, a latch being pivoted beneath the notched end, with a recess adapted to register with the surface of the body between the notches, the device being adapted for use by bookkeepers, etc., as a rest, a ruler, a paper, draft, and check cutter, a pen extractor, a foot rule, and a square.

ARTIST'S PORTFOLIO. — Flora M. La Bruce, Annandale, S. C. This is a light receptacle in which mounted canvas of various dimensions may be conveniently and expeditiously secured for transportation, the invention also providing means whereby the canvas will be prevented from moving vertically or laterally.

MUSIC HOLDER.—Hartwell R. Moore, Norwalk, Ohio. This invention provides an adjustable music holder for pianos and organs which will be practically out of the way and concealed when closed, the outward swinging hinged panel having the holder adjustable vertically on its rear face, and adapted to move downward when the panel is swung outward.

REED ORGAN.—Henry James, Waterbury, Vt. This invention consists of a resonating channel with short tubes opening into it, but which are not tuned, each of these tubes having an eschallot or opening over which operates a reed secured to the tube, whereby a very clear and full tone is obtained.

DUMPING CART.—Thomas Hill, Jersey City, N. J. This invention relates to carts or wagons for common road use, the bodies of which have side pivots or journals, for tilting them, and provides a novel construction of elastic pedestal for such pivots or journals, the invention being an improvement on former patented inventions in the same class by the same inventor.

DUMP CART WITH AUTOMATIC BRAKE. —Samuel Gantz, Hagerstown, Md. The construction of this cart is such that when the horse holds back, in going down hill, the cart body will slide back on the axle, and automatically put on the brakes, while as soon as level ground is reached, and the horse starts to pull, the brakes will be automatically removed from the wheels.

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BUILDING EDITION.

JULY NUMBER.—(No. 45.)

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3. Engraving of the Washington arch, of New York, designed by Stanford White, architect.
4. Perspective elevations and floor plans of three frame houses, costing two thousand three hundred and fifty dollars each, recently erected in Jersey City, N. J.
5. Illustration showing a block of economical frame houses recently erected in New Jersey. Floor plans.
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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv., p. 28.

Rotary veneer basket and fruit package machinery. I. E. Merritt Co., Lockport, N. Y.

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NEW BOOKS AND PUBLICATIONS.

THE ASSAYERS' MANUAL. An abridged treatise on the docimastic examination of ores, and furnace and other artificial products. By Bruno Kerl, Professor in the Royal School of Mines, Member of the Royal Technical Commission for the Industries, and of the Imperial Patent Office, Berlin. Translated from the German by William T. Brannt, editor of "The Techno-Chemical Receipt Book" etc. Second American Edition. Edited, with extensive additions, by F. Lynwood Garrison, Member of the American Institute of Mining Engineers, Fellow of the Geological Society of London, Member of the Verein Deutscher Eisenhuttenleute and Iron and Steel Institute, etc. Illustrated by 87 engravings. 8vo, 354 pages. Price $3. Philadelphia: Henry Carey Baird & Co., 810 Walnut Street; London: E. & F. N. Spon. 1889.

This volume is in every respect a most creditable performance. In the first place, the name of the eminent author of the original treatise—Bruno Kerl—is guarantee sufficient that the book as published in German was full and accurate, and presented at the time of its publication the best and most practical systems of assaying. And now this second American edition appears under the supervision of of a new editor and a most accomplished assayer, Mr. F. L. Garrison of Pennsylvania, who has greatly enlarged and elaborated it under nearly every head and brought it up fully abreast of the most advanced practice of the present day. It is amply and well illustrated and is beautifully printed, and last, not least, is, according to the invariable practice of the well known house by whom it was published, provided with a splendid table of contents and an admirable index. Not only can it be recommended as the best book on assaying in the English language, but any subject or process treated of can be turned to in a minute by means of its table of contents and index.

DIE HAUS- UND HOTEL-TELEGRAPHIE. Bearbeitet von O. Canter. Mit 114 Abbildung. Zweite Auflage. Wien, Pest, Leipzig: A. Hartleben's Verlag. Pp. xiv, 238.

This forms the fourteenth volume of the electro-technical library published by the well known house of Hartleben. It presents the subject very clearly and well, and is illustrated by a number of very handsome wood cuts, and forms a useful member of the library.

GEONOMY: Creation of the continents by the ocean currents; and Kosmonomia: The growth of worlds and the cause of gravitation. By J. Stanley Grimes, author of "Problems of Creation" and "Mysteries of the Head and Heart." Philadelphia: J. B. Lippincott Company. 1889. Pp. 139.

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AN EXACT REPRINT OF THE FAMOUS CENTURY OF INVENTIONS OF THE MARQUIS OF WORCESTER. (First published in 1663.) With introduction, notes, and a life of the author. By John Phin. With portrait after a painting by Vandyke. New York: The Industrial Publication Company. 1887. Pp. 67. Price $1.

This interesting work is what the title states it to be, a reprint of the famous "Century of Inventions," with a life of the Marquis of Worcester. The editing shows ability, and the work will be of great interest to all students of the history of science.

THE OFFICIAL RAILWAY LIST. A complete directory and handbook of useful information for railway men. Eighth year. Published by the Railway Purchasing Agent Company. 1889. Chicago. Pp. viii, 285.

This well known work appears again for the year 1889, making the eighth year of its publication. It consists of an index of the railroads of the United States, giving under each name the name and address of the officials thereof, forming a really indispensable compendium for all railroad men.

THE REPORTER'S COMPANION. By Benn Pitman and Jerome B. Howard. Cincinnati: The Phonographic Institute. 1889. Pp. 187.

This work is intended as a continuation, or rather a sequel, to the authors' "Manual of Phonography," and it is intended to embody the advanced style of the art. It is supposed to act as a step between the corresponding and the reporting style of phonography. It contains an exhaustive list of reporting logographs, word signs, phraseographs, etc., all of which will, of course, be of great interest to the reporter.

ILLUSTRATED INSTRUCTIONS FOR THE ERECTION OF ELECTRIC CONDUCTORS. By James W. Cole. Terre Haute. 1887. Pp. 96.

This book gives a number of illustrations of houses, churches, etc., showing how, in the author's view, lightning rods should be carried in order to protect houses properly. It forms a very practical and useful manual for the much abused lightning rod man, as well as for the proprietor of the building who wishes to have his ideas carried out in a correct way.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(994) T. T. E. writes: Can you recommend any chemical that, if put in the stumps of trees, will hasten decay? A. Bore holes in the stumps and pour in kerosene, and repeat a number of times. At the end of a few months' such treatment, set them on fire. Or, for the kerosene, substitute nitrate of potash, and burn. No effectual way of hastening decay is known to us.

(995) J. L. asks how to solidify paraffine oil. A. Some varieties of petroleum, it is said, can be solidified by heating with a little (3 per cent) glue dissolved in water. We fear that with purified oil you will not have much success. Slippery elm bark in decoction may prove efficacious.

(996) J. N. L. asks for the formula for making zylonite. A. A great many formulæ are given. The following is typical. Gun cotton (pyroxyline) is first reduced to a pulp by grinding in water. To this camphor is added in the proportions of 1 part camphor to 2 of the dry pyroxyline. By heating not above 300° Fah., under heavy pressure, and by repeated rollings, the mass is made homogeneous. Also see our SUPPLEMENT, No. 227.

(997) E. H. H. writes: I want to stick together two pieces of gutta percha, the same to be used in hot water. I cannot find any cement or glue that will hold. A. Gutta percha is united by heating the edges and pressing them together. As the material itself softens in hot water, it cannot be united so that the joint will not be softened by heat.

(998) C. H. asks: 1. What kind of paper is the best to use for cleaning the commutator on a dynamo? A. Fine sand paper followed by a little ground pumice stone on a dry cloth. Never use emery in any form. It is best to use a fine file followed by draw filing, and so avoid sand paper. 2. How many amperes does a 16 candle power 70 volt incandescent lamp require? A. About nine-tenths of an ampere. 3. Does a 25 candle power 70 volt lamp require more amperes than a 16 candle power of the same voltage? A. Yes; about 1½ amperes.

(999) L. T. asks (1) how to pronounce Eiffel, the title of the Eiffel tower. A. The French pronounce it Effel, here it is generally pronounced Iffel. 2. What is it in lettuce that causes one to feel drowsy? A. It is uncertain. Some chemists have claimed that it was due to a peculiar bitter crystallizable substance called lactucin. You will find the subject discussed in the U. S. Pharmacopœia, pp. 840, 843. 3. What is it that makes window glass, when you look at it certain ways, look colored like the colors of the rainbow? A. Probably a very thin film of some oxide on the surface giving the effect of colors due to "thin layers." 4. Why is it that when the sun is shining its brightest on glass the glass will be cold while an object on the other side warm; that is, how can it transfer heat without being warm itself. A. The glass is diathermous to a considerable extent, but gradually becomes warmed by rays passing through it. We cannot supply the other items asked for.

(1000) F. F. C. asks how he may solidify animal, fish, and vegetable oils to the consistency of lard by a cheap and simple way, that they may be used as axle grease for wagons or heavy machinery. A. You may make stearine from the oils, or may treat with alkali so as to convert them into soap. The following formula is a type for the latter class. Dissolve ½ pound caustic soda in 1 gallon water, add 3 pounds tallow and 6 pounds palm oil (or 10 pounds oil only). Heat from 200° to 210° Fah., and stir and allow to cool. Experiment with your oils on this line and you will probably evolve a good formula for your own case.

(1001) H. A. C. writes: Some time ago a man passed through this place decorating show windows with sketches and fancy lettering for advertising purposes. At a short distance, especially in the evening when the stores were lighted, this work resembled ground glass. Persons who saw him work told me he used something resembling a tallow candle. Can you tell me of anything which I can use for the same purpose? A. Tie a piece of putty in muslin, and after cleaning the glass use this by "dabbing." You can execute quite effectnal designs in this way.

(1002) Subscriber writes: I wish to saturate a considerable body of water (say a puncheon full) with sulphurous acid gas. For the purpose that I wish to use it, it does not need to be pure, as any impurities would do no harm. Can you give me a method of obtaining the sulphurous acid gas in quantities cheaply? Have seen the method given in U. S. Pharmacopœia, but that is for a pure gas. I thought there might be another method where, by being content with a less pure article, the manufacture might be much simplified. A. Heat oil of vitriol and sulphur or charcoal together, and sulphurous acid gas will be evolved in large quantities. This is about the cheapest process.

(1003) H. D. B. asks: 1. Which of the ordinary woods are best adapted to making imitation ebony by treatment with logwood? A. Cherry is very extensively used for this purpose, and is to be recommended. 2. What is the best method of polishing such imitation wood without taking off the colored surface? A. Polish as well as possible before staining, then polish lightly again. If properly stained, the color will have penetrated so as not to be affected by proper polishing operations. 3. A good recipe for a cherry stain for pine or whitewood. A. Use light mahogany stain as follows: Mix in a bottle 15 grains alkanet root, 30 grains aloes, 30 grains powdered dragon's blood, and 500 grains 95 per cent alcohol; cover with a bladder tightly tied over mouth, and shake it occasionally. In three or four days it can be filtered, and will be ready for use. Mordant the wood with dilute nitric acid, allow it to dry, and then apply the stain. Try some pieces of the wood first to see if it answers the purpose. 4. Can pine or whitewood be polished after being so stained? If so, how? A. It can be "French polished" by varnishing a number of times and rubbing down between the coats. We recommend the "French Polisher's Manual," 20 cents. 5. The name and price of a good cheap treatise on the treatment of ordinary woods, staining, polishing, painting, etc. A. We recommend Workshop Receipts, second series, $2. We can supply by mail the books mentioned above.

(1004) J. S. asks (1) how the fine blue color is given to the soft iron yoke and armatures of relay magnets? A. By heating the articles to about 500° Fah., over a fire or in an oven, and cooling in water when the proper color is obtained. 2. How to finely polish hard rubber. A. With buffs of leather or wool, using ground pumice and chalk to finish. The fine black color is put on before finishing by treating the article to a bath of bisulphide of carbon. 3. What is the best factory way to polish brass and iron preparatory to nickel plating? A. With leather buffs or brushes with flour of emery, ground pumice or tripoli and rotten stone, according to the fineness of finish required. 4. Are there any works treating on the above? A. We can supply you with Watts' "Electro Deposition," $3.50. 5. Will one horse power suffice to saw hardwood boards three-eighths inch thick with a circular saw 8 inches diameter? A. Yes.

(1005) W. L. S. asks (1) for the formula for making paste for patent leather. A. Patent leather is japanned. The first coats are made with linseed oil and Prussian blue boiled together, the last coat with linseed oil and lampblack boiled together. The successive coats are applied with the hand, and dried at 160° to 180° Fah. They may be polished also with pumice stone. Much skill and experience are required to produce any result. 2. How small pieces of wood, say 2 inches diameter by 4 feet long, may be easily bent and afterward retain their bent form. A. Steam in a wooden box, bend over a template, and allow to cool and dry while fastened thereon. 3. The composition used for gilding picture frames. A. Gold leaf is often used. Sometimes silver leaf is applied and varnished with orange-colored shellac varnish, thus giving it the appearance of gold. The operation is complicated, and needs experience and skill. It is described in the "Techno-Chemical Receipt Book," pp. 90, 91.

(1006) A. C. G. asks how cakes of black, blue, red, green, and white stencil paste are made. A. A number of receipts could be given. The following may suit: 8 ounces mastic in tears, 12 ounces shellac, 1 ounce Venice turpentine; melt together, add 1 pound wax, 6 ounces tallow; when dissolved add 6 ounces hard soap shavings (tallow soap) and mix, then add coloring matter, such as lampblack, Prussian blue, vermilion or carmine, chrome green, or white lead or other pigment. The cake should be brittle; it can be made into crayons for direct use or applied with a wet brush. Or as a body try the following: 1 pound resin oil, 13 ounces light colored resin, and 3 ounces soft yellow soap. Wet brush when applying. Color to suit as above.

(1007) J. A. V. asks (1) for a recipe in which to liquefy marine glue. A. Marine glue may be liquefied by heating on a water bath with benzole. It is perhaps best used in the solid state, heat being used to melt it. 2. How to express the juice from green hoarhound herb, and to prevent the same from souring, to be used for medical purposes. A. By boiling with water. Add to the solution 1-1000 of salicylic acid. The extract may lose its quality by standing.

(1008) W. B. writes: Given a square plot of ground two square miles in area, what is the length and what is the width of said grounds. A. A little over 1·414 miles.

(1009) W. McV. asks a recipe for making a first class (dope) grease to use in compression cups, something that will stand a good lot of heat before it runs freely. A. Good tallow melted and mixed with a small portion of lubricating oil makes a very good grease for wagons.

(1010) F. P. S. asks (1) whether a common cistern pump could work well, the pipe being 33 feet long horizontal and 11 feet perpendicular? A. Yes; the pump will draw water as stated, if the pipe is tight. 2. Is an artesian and a tubular well the same thing? A. A flowing well of any kind is generally styled an artesian well. A tube well is generally understood to mean the drive tube wells of moderate depth. 3. What power is required to run a 4 candle lamp dynamo? Which is the best motor to apply to such dynamo? A. The 4 candle dynamo will require ¾ horse power. A small steam engine is the most reliable.

(1011) J. F. O. asks for a good receipt to make Florida water.

A. Oil of bergamot	8 oz.
" " orange	4 "
" " lavender (best)	3 "
" " cloves	1½ "
" " cinnamon (true)	¼ pt.
Tincture of orris	½ "
" " Peru balsam	¼ "
Alcohol 95 per cent	4 gals.
Water	6 pt.

Mix and let stand for some days before bottling.

(1012) W. G. N. asks how to join two rubber tubes together. I have a three-eighths inch tube 18 inches long, and I want to connect a one-quarter inch tube at an angle of 45° about the center of the three-eighths one. A. Have a proper connection made like a T out of brass, tin, or glass tubing. Cut your three-eighths inch tube in the middle, slip it over the ends of the metal direct tube, and slip the ¼ inch tube over the branch. You cannot make a good connection otherwise. If necessary, bind with wire or cord the rubber tube where it is slipped over the connecting piece.

(1013) H. L. B.—Trees have been removed on the streets and parks of New York that were 30 feet high. A low platform wagon or a stone boat is all that is needed, with a derrick for handling. This work should be done when the ground is frozen, if possible, so that the roots and soil may be removed together. This is done by making a trench around the roots just before hard frost, and undercutting at a depth sufficient to save most of the roots. The ball is frozen if necessary by throwing water on its exterior.

(1014) H. H. A. asks how railroad curves are measured by degrees, for instance, what is the radius of a 14 degree curve, and what is the sharpest curve on any railroad in the United States? A. A 14 degree curve on a 100 foot chord is about 205 feet radius. The elevated railroads in New York and Brooklyn have very short curves, about 100 feet radius. See Trautwine's "Engineer's Pocket Book" for various methods of laying out curves. We mail it for $5.

(1015) C. W. D. asks how to regild moulding damaged by smoke. A. The tarnished places should be wiped or washed clean, then sized with a thin white glue size, and the leaf applied while the size is tacky.

(1016) C. C. W. writes: I am carving a mahogany mirror frame. How shall I finish it in order that the color shall darken by age? A. Oil with boiled linseed oil; when thoroughly dry, rub smooth with fine sand paper, and varnish.

(1017) L. R. W. asks: How can I remove the amalgam from copper plates without injury to the plates? A. Cover the plates with charcoal, and heat to low redness. The plates will be somewhat injured, and necessarily so, as the mercury will have penetrated to a greater or less depth.

(1018) J. W. D. asks: 1. How is the ordinary horseshoe magnet made, and charged with magnetism? A. A bar of steel tempered to a straw color after being properly shaped is surrounded with a coil of wire wound in one direction, through which a strong current of electricity is passed. This magnetizes it. 2. How long will one hold its power if kept continuously in use? A. If a keeper or armature is kept in constant contact with it, it will last for many months or years. If the armature is often pulled off, it rapidly weakens. 3. Give numbers of SCIENTIFIC AMERICAN that contain articles on magnetism? A. See our SUPPLEMENT catalogue, in which a great many articles are indexed.

(1019) R. P. G. asks: What will make leather air tight, and yet allow its flexibility? A. Soak it thoroughly with a non-drying oil; sweet almond is excellent. Glycerine may also be used.

(1020) W. H. asks: 1. For formulas for Florida water. A. See answer to query No. 1011. 2. For bay rum.

A. Oil of bay	½ ounce.
Loaf sugar	2 ounces.
Alcohol 95 per cent	1 pint.
Rectified spirits 60° or New England rum	7 pints.

Beat up the sugar and oil together and add the alcohol and finally the spirit or rum. The rum is preferable.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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June 25, 1889,

AND EACH BEARING THAT DATE.

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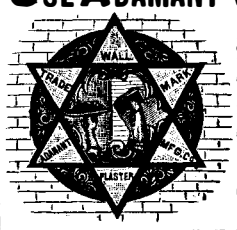

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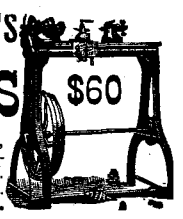

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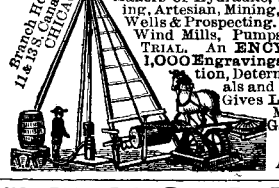

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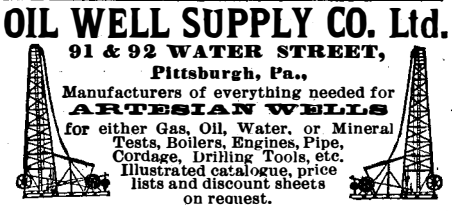

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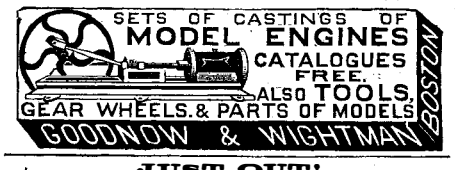

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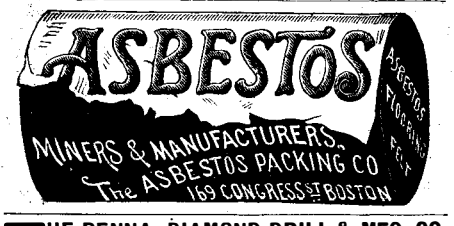

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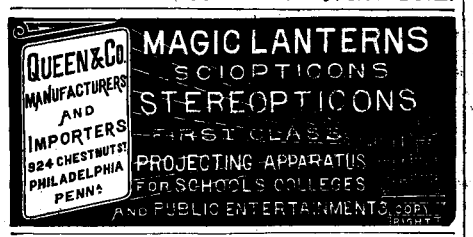

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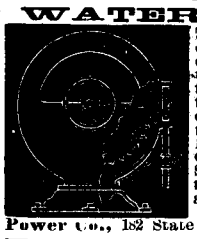

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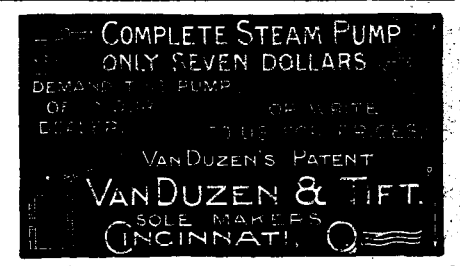

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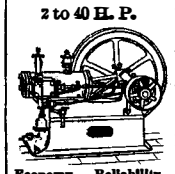

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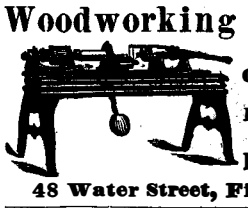

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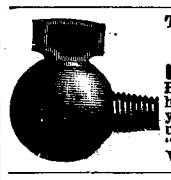

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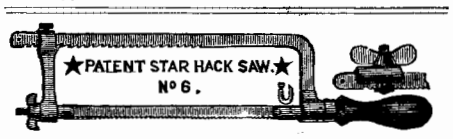

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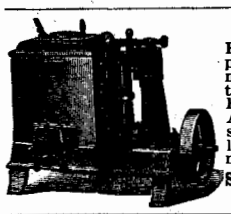

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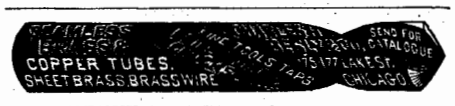

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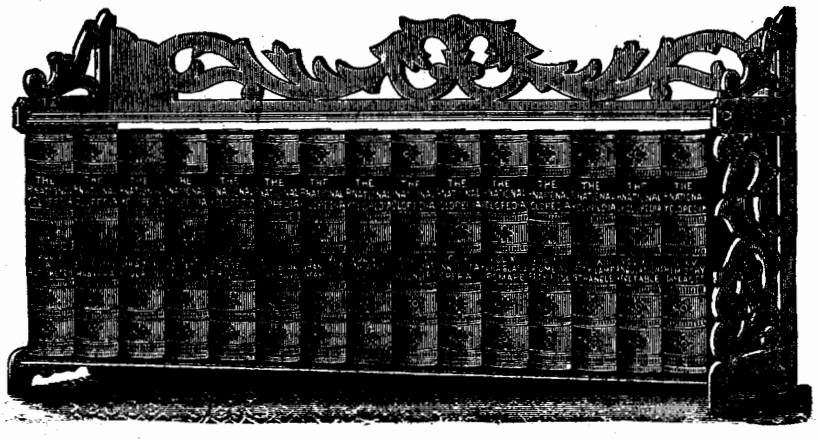

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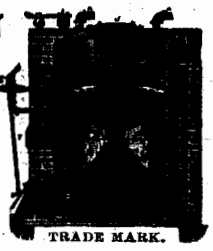

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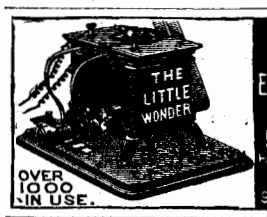

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